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DE FLUITER (H. J.). **Resultaten, verkregen bij de bestrijding van de witte luis van de koffie langs mechanischen en chemisch-mechanischen weg en door cultuurmaatregelen.** [Results in the Control of the White Mealybug of Coffee by Means of mechanical, chemical-mechanical and cultural Measures.]—*Bergcultures* **12** no. 27 pp. 884–891. Batavia, 1938.

Recommendations for the control of white mealybugs infesting coffee in Java have been published [*R.A.E.*, A **26** 182]. The results recorded here were obtained against *Pseudococcus citri*, Risso.

In plantations above 2,000 ft., lamtoro (*Leucaena glauca*) is the primary food-plant of this mealybug, and the measures that proved successful were mainly directed against infestation of this plant. They consisted in pruning to prevent the formation of flower-clusters, which are the part of the plant on which the mealybug occurs in greatest numbers. In some cases removal of the flower clusters proved adequate ; in others radical pruning of all foliage and flowers was carried out. In a few instances also, the coffee was sprayed with an insecticide.

In plantations below 2,000 ft., coffee is the primary food-plant from which *P. citri* passes to lamtoro. Brushing the flower clusters of the coffee with an insecticide emulsion gave good results, but at ruling prices the increased crop did not cover the cost. Increasing the shade for coffee reduced infestation by the mealybug, but also reduced the coffee crop, so that it is not economically justified. The removal of the withered blossom parts after flowering resulted in less loss of berries. Good results were also attained by grafting on a selected stock that appeared to be resistant to attack.

TARWID (K.). **O pewnych konsekwencjach niektórych nowszych badań biocenologicznych.** [Certain Deductions from some of the latest Investigations on Biocoenosis.]—*Roczn. Ochr. Rośl.* **5** fasc. 4 pp. 16–23, 12 figs., 8 refs. Puławy, 1938.

This paper is based on the mathematical investigations of Volterra on the effect of the struggle for existence among various organisms and the experiments of Gauze that supplement them, and it is designed to show the bearing of such investigations on problems of the natural control of insect pests. As is well known, the population of a species living in a balanced association is maintained at a more or less constant level, but shows oscillations that may or may not be periodical, and its numerical character depends on the biocoenosis, in which the factors include natural enemies and competitors for food or anything else necessary for existence.

The points discussed include : interaction between a monophagous parasite and its host when their ecological requirements do or do not exactly coincide ; the effect of one or more polyphagous natural enemies on the population of a given species ; the possibility of eliminating one of a number of competitors in a biocoenosis by the introduction of an additional competitor ; the increase of an injurious species that may result from the application of an artificial control measure that destroys it and its parasite in equal proportions ; and, with particular reference to measures against a pest in a stage in which it is not injurious, the way in which an artificial reduction in numbers of the pest is offset by the reaction of the biocoenosis in the direction of an increase of its population.

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Obarski (J.). **Pluskwiaki różnoskrzydłe (Hemiptera-Heteroptera), obserwowane w Polsce na tytoniu w latach 1930–1937.** [Heteroptera observed in Poland on Tobacco in the Years 1930–37.]—*Roczn. Ochr. Rośl.* **5** fasc. 4 pp. 44–48, 5 refs. Puławy, 1938. (With a Summary in English.)

A list is given of 18 species of Heteroptera observed on cultivated tobacco in Poland, with brief notes on their distribution, economic importance, seasonal occurrence, and food-plants. The only species that were abundant and caused appreciable damage were *Dolycoris baccarum*, L., and *Lygus pratensis*, L., on both *Nicotiana tabacum* and *N. rustica*, and *Therapha* (*Corizus*) *hyoscyami*, L., on *N. rustica*.

Ruszkowski (J.), Zweigbaumówna (Z.) & Blockówna (H.). **Stan zdrowotności roślin uprawnych w Polsce w roku 1937.** [The Condition of cultivated Plants in Poland in the Year 1937.]—*Roczn. Ochr. Rośl.* **5** fasc. 4 pp. 49–102, 4 refs. Puławy, 1938.

This paper contains records of pests and diseases of cultivated plants and forest trees observed in various parts of Poland during 1937. They are arranged under the plants attacked, and brief notes are given on their local distribution and abundance, and the extent of the damage caused.

Sprawozdania z konferecyj i zjazdów w sprawach ochrony roślin w styczniu roku 1938. [Reports presented at the Conference and Meetings on the Questions of Plant Protection held in January of the Year 1938.]—*Roczn. Ochr. Rośl.* **5** fasc. 4 pp. 109–174, 1 map, 7 refs. Puławy, 1938.

This report comprises summaries of the papers read at a conference held in Warsaw in January 1938 and of the discussions that followed them. They include the following papers that deal with insect pests in addition to two (by W. Szymański and J. Prüffer), which have already been noticed [*R.A.E.*, A **26** 98; **27** 9]:

Ruszkowski (J.). Rozmieszczenie występowania korówki wełnistej w Polsce w 1936 i 1937 [The Distribution of the Woolly Aphis in Poland in 1936 and 1937], pp. 123–128. No appreciable changes have taken place in recent years in the status of the woolly apple aphis [*Eriosoma lanigerum*, Hsm.] in Poland, where it occurs in the west and south-west [*cf.* **24** 814]. A survey of fruit-tree nurseries carried out in 1936 and 1937 in 13 and 8 provinces, respectively, revealed the presence of the Aphid in 7 and 9 per cent. Its spread is being checked by prohibition of the sale of trees from nurseries that do not possess certificates of freedom from infestation. *Aphelinus mali*, Hald., which has established itself in some parts of Poland [**24** 131, 655] has also been introduced into Silesia from England and Barcelona and liberated in 34 localities, in some of which it is very active.

Kéler (S.). W sprawie zwalczania wołka zbożowego [The Control of the Granary Weevil], p. 130. In Poland, infestation by *Calandra granaria*, L., is more severe in mills than in grain-merchants' stores. Its control in granaries is very difficult, as they are numerous, widely distributed and of poor construction. A method of destroying the weevils in the process of the cleaning of the grain is briefly described [**23** 351].

Kuryłło (A.). Płaszczyniec burakowy i jego zwalczanie w świetle tegorocznych obserwacyj. [The Beet Bug and its Control in the Light

of Observations in the current Year], pp. 133–135. An account is given of the results of further investigations on the bionomics of *Piesma quadratum*, Fieb., in Poland [*cf.* **24** 676], where it has been responsible for losses of up to 75 per cent. of the yield of sugar-beet and has reduced the sugar-content of the roots by up to 35 per cent. It occurs in the whole of the province of Poznán and in 4 districts of the province of Łodz. It has two generations annually, but it has not been ascertained whether the second completes its development; the fact that nymphs of all instars were found in the middle of September indicates that at least some of them die before the life-cycle is completed. Besides beet, the bugs also fed on plants of several orders, but they completed their development only on Chenopodiaceae. Beet, spinach and mangels were the only plants that they infected with leaf crinkle. Special investigations showed that this disease is not transmitted by *P. maculatum*, Lap., the brachypterous or macropterous forms of *P. capitatum*, Wolff, or *Lygus pratensis*, L. [*cf.* **25** 582]. Of 27 varieties of beet tested, none proved to be resistant to it. Experiments to determine the minimum depth to which trap strips of beet should be ploughed in to bury the bugs showed that they were unable to make their way to the surface of the soil from under a layer 3–4 ins. thick, but were still alive after 11 days. It would not, therefore, be advisable to plant potatoes in the ploughed trap strips, since some of the surviving bugs might be brought to the surface when the potatoes were earthed. Three years' observations have shown that sowing the beet as late as possible (up to 18th May) after the trap strips have been ploughed in, safeguards the crop from leaf crinkle and does not affect the yield and sugar-content of the roots.

Strawiński (K.). Sprawa obowiązku zwalczania szkodników sadów [Report of the Division of Orchard Pest Control], pp. 135–137. Fruit trees in Poland are often attacked by larvae of *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, auct.), *Aporia crataegi*, L., *Lymantria dispar*, L., and *Malacosoma neustria*, L., which can be comparatively easily controlled by mechanical measures. A general desire has been expressed that such measures should be made compulsory. In view of this, the author suggests the text of a regulation that would enable local authorities, after consultation with the Station of Plant Protection, to enforce the application of mechanical control measures (which should be specified).

Minkiewicz (S.). Pewne obserwacje nad biologią owocówki jabłkówki w r. 1937 [Certain Observations on the Biology of the Codling Moth in 1937], pp. 173–174. Observations on *Cydia* (*Carpocapsa*) *pomonella*, L., were continued in 1937 [*cf.* **26** 99] to determine what percentage of larvae enter apples through the calyx. Daily examination of fallen fruits throughout the season and of fruits picked from trees showed that 70–91·3 per cent. of the larvae entered the apples at the side, 1·3–14·7 per cent. at the stem end and only 1·5–10 per cent. at the calyx. It appears, therefore, that a calyx spray is of little importance. Field observations have shown that the females of the overwintered generation oviposit from about 1st June to 20th July, maximum oviposition occurring at the end of June, and those of the summer generation lay eggs in August. As, however, most of the first-generation larvae hibernate, the second generation is of relatively little importance. Sprays should be applied at least three times, when the apples are the size of hazel nuts, when they are the size of walnuts, and at the end of July.

STRICKLAND (A. G.). **Vine Diseases and Pests in the Murray Irrigation Area.**—*J. Dep. Agric. S. Aust.* **42** no. 2 pp. 128–134, 3 figs. Adelaide, 1938.

This paper deals mainly with fungus diseases of grape vines in South Australia. Of the insect pests the most important is probably the light-brown apple moth [*Tortrix postvittana*, Wlk.], which may injure the bunches severely, particularly in wet seasons favourable to mould development on damaged bunches. The larvae overwinter on other plants [*cf. R.A.E.*, A **25** 295], and no winter control measures are available. Investigations on control are proceeding and indicate that at least one application of a spray of lead arsenate (2 lb. to 50 gals.) should be made just after the fruit sets, and that an earlier application may be desirable. A mealybug [? *Pseudococcus adonidum*, L.], occasionally damages the bunches of grapes. Its white waxy covering makes it difficult to wet with any summer spray, and it is best dealt with in winter by applying a contact insecticide, such as red oil emulsion, to all parts of the vine and its supports.

A mite [*Eriophyes vitis*, Land.] punctures the lower surface of the leaves, causing blisters on the upper surface and abnormal numbers of leaf hairs under the blisters. It spends the winter in the bud scales and can be controlled by a dormant spray of lime-sulphur (1 : 12). Applications of a dusting sulphur against *Oidium* keep its numbers down during the growing season.

Memoria de la Estación experimental agrícola de La Molina correspondiente al año 1936. [Report of the La Molina Experiment Station for 1936.]—*Mem. Estac. exp. agric. Minist. Fom. Peru* no. 9, 253 pp., illus. Lima, January 1937 [1938].

A section by J. E. Wille (pp. 93–127) deals with surveys of insects in Peru and measures for their control. Most of the pests have been noticed from previous reports [*R.A.E.*, A **26** 533, etc.].

In southern Peru, where *Dysdercus ruficollis*, L., causes damage to cotton mostly sporadically, migration from the cotton-fields to neighbouring areas occurred in May, as a result of the revival of wild vegetation by rain. Control of the stainer should be based on practices restricting the period during which cotton provides it with the means of sustenance and reproduction [*cf.* **25** 113], supplemented by hand collection, irrigation, which destroys the eggs and larvae in the ground, and trapping with baits and light. It was parasitised by the Tachinids, *Acaulona peruviana*, Tns. [*cf.* **23** 115] and *Paraphorantha peruviana*, Tns., but the rate of parasitism was low. *D. mimus*, Say, which in Peru usually attacks wild Malvaceae [**26** 533], was found on cotton in Ecuador. A new food-plant, *Hibiscus rosa-sinensis*, was recorded for *Anthonomus vestitus*, Boh. A single larva of this weevil was observed in November feeding on the tender leaves of a young shoot of cotton. It was taken to the laboratory and developed to the adult stage. The fact that eggs may be laid and the larvae develop in shoots when neither flower buds nor bolls are available indicates a change in habits. Experiments against *Thrips* sp. on cotton showed that irrigation every 7 days decreased its numbers ; they increased when the interval was 21 days. *Aphis gossypii*, Glov., became abundant in several valleys, one reason being the destruction of natural enemies by extensive dusting with calcium arsenate to prevent expected infestation by *Anomis luridula*, Gn. (*texana*, Riley) and other leaf pests. Dusting should be limited to

plots actually attacked by them. Cotton seed was infested by the Pyralid, *Moodna ostrinella*, Clem., and was fumigated with hydrocyanic acid gas.

Pests of sugar-cane were not responsible for much injury, but considerable damage to coca [*Erythroxylon coca*] was caused by the Lymantriid, *Eloria noyesi*, Schaus [*cf.* **20** 305]. Calcium cyanide in the form of Calcid briquettes was successfully used for fumigation of *Citrus* against Coccids.

McCoy (E. E.), Girth (H. B.) & Glaser (R. W.). **Notes on a Giant Form of the Nematode** *Neoaplectana glaseri*.—*J. Parasit.* **24** no. 5 pp. 471–472. [Urbana, Ill.] 1938.

A brief description is given of the abnormally large gravid females of *Neoaplectana glaseri*, Steiner, that are occasionally observed parasitising larvae of the Japanese beetle [*Popillia japonica*, Newm.] in the United States. In investigations, these Nematodes measured up to 9 mm. in length, and one that measured 8 mm. produced 1,420 larvae [*cf. R.A.E.*, A **20** 472]. The host larva died as a result of parasitism by this female and a normal male. No genetic strain of large individuals could be established. It is suggested that the form is due to delayed fertilisation, leading to abnormal body development ; it occurs only in host larvae that contain less than 10 parasites and therefore afford favourable conditions of nutrition and environment.

Isely (D.). **A Cicada as a Cotton Pest.**—*J. Kans. ent. Soc.* **11** no. 4 pp. 142–143. McPherson, Kans., 1938.

In 1937, the oviposition punctures of a Cicadid, *Diceroprocta vitripennis*, Say, caused serious local damage to cotton growing in river bottoms in several counties in eastern Arkansas. On the most severely infested plantation, the cotton was killed or so severely injured that it was ploughed up over an area of 15 acres.

The adults were active from mid-June to mid-July. The eggs were laid, 16–49 in each series of punctures, in the stems of young plants, the branches of older ones, and occasionally in leaf petioles. The plants died above these points, but many branched out again below. In these cases there was little loss as the end of the season was favourable to cotton. Other plants and trees were injured in the same way. All injury was in fields near trees with thick undergrowth, where the cicadas spent the nights and the cooler parts of the days. Activity in flying and oviposition increased with the temperature. The trees were apparently not necessary as food-plants for the immature stages ; on one plantation, the nymphs emerged from the soil in cotton fields that had been in cultivation for at least 80 years.

Late planting probably favoured the infestation, as earlier ploughing and hoeing might have destroyed the nymphs near the surface of the soil.

Parker (R. L.) & Lamerson (P. G.). **Small-Fruit Insects.**—*Bienn. Rep. Kans. hort. Soc.* **44** pp. 107–115. Topeka, 1938.

Notes are given on the life-history and control of the more important insect pests of vines, strawberries and bush fruits in Kansas. They comprise most of those recorded in a previous abstract [*R.A.E.*, A **19** 89].

PARKER (R. L.) & LAMERSON (P. G.). **Substitutes for Lead Arsenate used as Sprays for Codling-moth Control during the Season of 1936.**—*Bienn. Rep. Kans. hort. Soc.* **44** pp. 115–121, 4 refs. Topeka, 1938. **Substitutes for Lead Arsenate used as Sprays for Codling-moth Control during the Season of 1937.**—*T.c.* pp. 121–130, 1 ref. **A Five-year Summary of Codling-moth Control in Kansas (1933–1937).**—*T.c.* pp. 130–133, 5 refs.

The first two papers comprise accounts of experiments on the control of the codling moth [*Cydia pomonella*, L.] on apple in Kansas in 1936 and 1937, in continuation of previous work [*R.A.E.*, A **25** 91, 92]. In the third paper, in which are summarised the results obtained in the five years 1933–37, it is concluded that the insecticides substituted for lead arsenate are decidedly inferior to lead arsenate alone or in combination with summer oil emulsions. For effective control it is still necessary to use lead arsenate (at the rate of at least 3–4 lb. per 100 U.S. gals. spray), and some spreader and adhesive (of which the best are oil emulsions) to bring about a certain amount of ovicidal action as well as to build up the load of toxic material on the surface of the apple. Non-astringent lead arsenate without a spreader or adhesive has been effective during dry seasons.

LAING (J.). **Host-finding by Insect Parasites. II. The Chance of *Trichogramma evanescens* finding its Hosts.**—*J. exp. Biol.* **25** no. 3 pp. 281–302, 5 figs., 6 refs. London, 1938.

The following is the author's summary of further investigations on the way in which females of *Trichogramma evanescens*, Westw., find eggs of their host, *Sitotroga cerealella*, Ol. [*cf. R.A.E.*, A **26** 150].

Experiments are described in which *Trichogramma* females were provided with *Sitotroga* eggs arranged at various distances from 0·05 to 0·40 in. The frequency with which the parasite found the neighbouring egg varied inversely with the distance between the eggs. The relation between frequency of contact and distance between the hosts depends chiefly, but not entirely, on chance.

The rate of finding the eggs varied inversely with the distance between them. By consideration of the conditions of the experiments, this relation between the rate of finding and the distance between the eggs is seen to indicate that the *Trichogramma* does not seek at random over the whole area available for movement, but restricts its search to the neighbourhood of hosts.

From experiments with eggs of four sizes, it is shown that frequency of neighbouring contact is correlated positively with the size of the eggs. The influence of size is largely mechanical, but not entirely, for small eggs of *Sitotroga* are found less efficiently in proportion to their size than are larger eggs.

When provided simultaneously with hosts of two different sizes, a *Trichogramma* finds more of the larger than of the smaller hosts. If the hosts are arranged alternately, the amount of selection that occurs by finding depends entirely upon the relative sizes of the eggs. If they are arranged in separate groups, however, relatively more of the larger eggs are found.

Hardy (A. C.) & Milne (P. S.). **Studies in the Distribution of Insects by Aerial Currents. Experiments in Aerial Tow-netting from Kites.**—*J. Anim. Ecol.* **7** no. 2 pp. 199-229, 3 pls., 15 diagr., 17 refs. London, 1938.

The following is substantially the authors' summary of experiments carried out in England in 1932-35 : The insects carried by convection currents and wind, the " aerial plankton," were investigated between the heights of 150 and 2,000 ft. by collecting nets carried up by kites. The nets were sent up closed, opened automatically at the desired height, and closed again before being hauled down. The equipment and technique are fully described. During a total flying time of 124½ hours, 82 samples were taken, yielding a collection of 839 insects. The aerial plankton is composed essentially of small or light-bodied insects with weak powers of flight but with relatively large wing surface compared with body mass. Its composition at different heights is determined and the height distribution of the different families compared. A list of the species identified is appended. The influence of weather conditions is discussed. Different insect groups are shown to be affected somewhat differently, but high temperature and low humidity are found for all to be more favourable to aerial drift than the reverse conditions. The average density of the drifting population is estimated for different height ranges up to 2,000 ft. The injurious insects collected included five species of Aphids, *Kakothrips pisivorus*, Westw. (*robustus*, Uzel) and *Oscinella frit*, L.

Bonnamour (S.). **Nouvelle note sur** *Carpophilus hemipterus*, **L. (Col. Nitidulidae).**—*Bull. Soc. linn. Lyon* **7** no. 2 pp. 57-58. Lyon, 1938.

The author states that in July 1937, he observed numerous larvae of *Carpophilus hemipterus*, L., which attacks dried fruits, in rotting fallen fruits of persimmon (*Diospyros kaki*) near Lyons. He later collected them in considerable numbers by leaving small piles of the fruits on the ground.

Mesnil (L.). **La cécidomyie du chou-fleur dans la région de Saint-Omer.**—*Ann. Epiphyt. Phytogén.* (N.S.) **4** fasc. 2 pp. 281-311. Paris, 1938.

An account is given of the history of the cultivation of summer varieties of cauliflower in the marshes of north-eastern France and of their infestation by *Contarinia nasturtii*, Kieff. (*torquens*, de Meij.). The adult of this Cecidomyiid is described, and its bionomics and the injury it causes [*R.A.E.*, A **19** 274] are dealt with at length. In addition to the complete destruction of the inflorescence, two forms of injury may occur ; if the cauliflower is attacked about a fortnight after planting out, a partial and irregular inflorescence is produced, and if it is attacked after the inflorescence is formed, the larvae develop in the flower without causing malformation, but the flower sometimes becomes infected with bacterial rot.

Experiments on three methods of control are described at length. An account of those on insecticides, which were entirely satisfactory, has already been noticed [**25** 462]. Repellents had no effect, success that was at first attributed to them being found to be caused by the

insecticidal effect of the ground-nut oil that was included in all formulae [*cf.* **22** 117; **25** 649]. Experiments with various artificial manures showed that they had no influence on the injury caused. All varieties of cauliflower grown seem to be equally susceptible to attack. The paper concludes with recommendations for spraying based on the results of the experiments.

Raucourt (M.), Trouvelot (B.) & Castets (G.). **Les résidus d'arsenic sur les pommes et les poires traitées contre le carpocapse.**— *Ann. Epiphyt. Phytogén.* N. S. **4** fasc. 2 pp. 337-356, 7 refs. Paris, 1938.

In July 1935, the regulations governing the spraying of apples and pears in France with arsenicals against *Cydia* (*Laspeyresia*) *pomonella*, L., were revised to permit applications at any time except within two months of harvest, instead of only during the five weeks following flowering. Experiments were carried out in 1935 and 1936 with a view to further reforms. The 1935 experiments, which took place in commercial orchards in all parts of France and in most of which the arsenical used was lead arsenate, are reported in this paper. In the few cases in which dusts also were used, it was shown that dust was much less persistent than spray. Putting bags on the fruits after several applications of spray dispenses with the need for the last sprays, but decreases washing by rain. This factor was shown to account for only 11 per cent. of the reduction in the proportion of arsenic residue to fruit, 69 per cent. being due to the growth of the fruit, and the remaining 20 per cent. to other causes. In one case in which wiped and unwiped pears were compared, wiping was found to reduce the residue by half. The usual arsenic tolerance in countries where one is imposed (0.01 grain As_2O_3 per lb. fruit) is equivalent to 1 mg. arsenic (As) per kg. The average load of arsenic on fruit sprayed in accordance with the 1935 regulations was well below this. In the whole of France, apples are harvested after the 20th September, so that spraying may continue until 20th July. This almost assures complete control except in the extreme south. Pears, however, can be harvested at the beginning of September in the north and the end of July in the south of France, and spraying until two months before does not give adequate protection. In some cases, the old regulations allowed of later applications than the new. Only when the interval between the last application and harvest was less than 45 days, was the average residue more than 1 mg. However, a part of the fruit may bear heavy loads, and the question of lead residues has not yet been studied. In the case of fruit treated less than two months before harvest, the strength of the spray, the method of application and, above all, the shape of the tree affect the residues.

In conclusion, it is suggested that, if an extension of the period during which arsenical sprays may be applied is contemplated, the strength of the sprays should be limited to 0·8 lb. arsenic per 100 gals., oil should not be used in late treatments, no arsenical sprays should be applied later than 15th August, after which date they seem to be valueless, cleaning of the fruit should be more generally practised, and provision should be made for chemical analysis of samples of fruit on the market and for the taking of proceedings against those who had applied sprays above the allowed strength or not cleaned their fruit sufficiently.

Busnel (R. G.). **Influence du régime alimentaire sur la biochimie et la biologie du** *Leptinotarsa decemlineata* **Say à l'état d'insecte parfait : Action du** *Solanum demissum* **Dun. et des hybrides de cette plante.**—*C. R. Acad. Sci.* **206** no. 9 pp. 694–696, 2 refs. Paris, 1938.

The author investigated biochemical changes in adults of *Leptinotarsa decemlineata*, Say, fed on *Solanum demissum* after emerging from the soil. Such individuals showed an increased rate of mortality and a reduction in weight compared with those fed on potato, and they entered hibernation 13 days later.

Leuzinger (H.). **Quelques observations biologiques sur la pyrale grise du mélèze** (*Semasia diniana* **Gn.) en Valais.**—*Bull. Murith.* **55** pp. 60-66, 6 refs. Sion, 1938.

A brief account is given of an outbreak of *Enarmonia* (*Semasia*) *diniana*, Gn., in forests of larch [*cf. R.A.E.*, A **18** 433] at altitudes of about 3,000–7,000 ft. in the Rhône Valley, Valais, Switzerland, in the summer of 1937, and previous outbreaks of this Pyralid in the district are reviewed. Adults were present from July to late August, and females oviposited in the lichen on the branches of the larches. As at the beginning of October no pupae could be found in litter at the foot of the trees, but eggs were still present in the lichen, the author considers that the view that the eggs overwinter is correct [*cf.* **18** 434]. Considerable retardation in growth is caused by larval feeding on the needles, but no practicable large-scale measure of control is as yet available.

Morgenthaler (O.). **Der Milbenbefall der Honigbiene, ein neu entstandener Parasitismus ?** [Infestation of Honey Bees by Mites, a new Form of Parasitism ?]—*Mitt. naturf. Ges. Bern 1937* pp. 133–147, 5 figs. Bern, 1938.

A general account is given of the infestation of honey bees by *Acarapis woodi*, Rennie, which occurs locally throughout western Switzerland. Experiments near Berne showed that the infestation may persist in a hive at a low rate for several years, as the mite does not reproduce rapidly enough to infest all the workers, which live only 4–5 weeks in summer. Bees over 5 days old showed considerable resistance to the infestation. There is danger of all bees being infested during the winter if more than half are attacked in the autumn.

Bovey (P.) & Leuzinger (H.). **Présence en Suisse de** *Ceresa bubalus* **F., membracide nuisible d'origine américaine.**—*Bull. Soc. vaud. Sci. nat.* **60** no. 247 pp. 193–200, 5 figs., 9 refs. Lausanne, 1938.

In April 1938, serious damage to branches of pear tree by the oviposition punctures of *Ceresa bubalus*, F., was found to have occurred near Sion (Valais), and subsequent observations showed that this American Membracid was present on pear trees throughout the district and also on lucerne near the trees, which was probably its chief food-plant. The state of the trees indicated that some had been injured prior to 1934. The literature on the occurrence of *C. bubalus* in Europe is reviewed [*cf. R.A.E.*, A **26** 343].

Weber (H.). **Grundriss der Insektenkunde.** [An Outline of Entomology.]—Roy. 8vo, xii+258 pp., 154 figs. Jena, Fischer, 1938. Price, paper *Mk.* 12·50, bound *Mk.* 13·50.

The object of this book is to provide an outline of entomological knowledge that shall satisfy the requirements of non-specialists who desire more detailed information than is normally included in text-books of zoology, or of others who need a comprehensive digest of the subject. It comprises three main parts, in which the author deals, respectively, with the development, structure and functions of the insect body, the structural characteristics of the chief insect groups, and ecology. This last part includes sections on insect habits, the relations of insects to one another and to plants, the ways in which they are protected from attack, their dependence on environment, and variations in population. In conclusion, the problems of applied entomology are very briefly summarised.

Nolte (H. W.). *Calosoma sycophanta* **als Feind der Nonne.** [*C. sycophanta* as an Enemy of the Nun Moth.]—*Anz. Schädlingsk.* **14** pt. 11 pp. 129–132, 1 fig., 7 refs. Berlin, 1938.

Komárek has pointed out the difficulty of using parasites for the biological control of the nun moth [*Lymantria monacha*, L.] and suggested the possible value of predators [*R.A.E.*, A **25** 526]. Of these the chief are *Calosoma sycophanta*, L., and bugs.

The author found *C. sycophanta* attacking *L. monacha* in large numbers in a forest in Saxony in 1937 and gives a brief account of its biology, based partly on his own observations and partly on those made by workers in the United States in connection with its use for the control of *L. dispar*, L. Both adults and larvae are predacious throughout their period of activity, and this period is identical with that during which larvae and pupae of *Lymantria* are available. The adults, which may live for 3 years, leave their winter quarters in June and return to them in August. The eggs are laid in the ground, the average number per female being 100 annually, and the maximum recorded 653 in 3 years. The larvae hatch in 3–10 days, complete their 3 instars in about a fortnight and then pupate, usually in the soil. The young adults remain in the pupal cells until the following spring. The author found that in Germany both larvae and adults fed mainly on the larvae and pupae of *L. monacha* and also attack freshly emerged adults not yet able to fly. The way in which this Carabid attacks the larvae and pupae and the appearance of pupae killed by it are described. From observations made by the author, 3 beetles destroyed 206, 258, and 224 larvae and pupae, respectively, in 50 days, figures that are similar to those recorded for *L. dispar* in the United States. Further evidence of the value of *C. sycophanta* was the fact that it had destroyed 29·7 per cent. of 2,020 pupae of *L. monacha* collected in the forest in Saxony. Its organised use for biological control should therefore be of value against this moth in Germany, as it has proved to be against *L. dispar* in the United States. If adhesive bands are used, the young larvae should be placed on the trunks above them. It is probable that the full-grown larvae can cross the bands, as the adults are known to do, but, in any case, the larvae are able to pupate on the tree.

Ext (W.). **Neue praktische Erfahrungen in der Maikäferbekämpfung in Schleswig-Holstein.** [New practical Experiences in Cockchafer Control in Schleswig-Holstein.]—*Anz. Schädlingsk.* **14** pt. 11 pp. 132–134. Berlin, 1938.

Melolontha melolontha, L., is the predominant cockchafer in Schleswig-Holstein, *M. hippocastani*, F., being in a small minority. Both usually have a 4-year cycle. In 1938, about 214 tons of beetles were destroyed as a result of organised collection following intensive propaganda. In all, 35,000 people were engaged in the work (they received 0·05*RM*. per kg. for the beetles caught), and 301 collecting sheets were distributed to 65 localities. The most practical size for the sheets was $13 \times 10\frac{1}{2}$ ft. The number of beetles collected in the chief flight area was estimated to be about 40 per cent. of those present.

Massive hedges, so wide that it is difficult to collect the beetles from them, are a feature of the countryside in Schleswig-Holstein. Laboratory and field experiments in 1937 with proprietary insecticides containing dinitro-o-cresol had shown that sprays were promising but dusts were unsuitable. In 1938, field tests with the sprays were carried out on a large scale, and they were found to free the hedges from the beetles rapidly and to keep them from re-infestation.

Bodnár (J.) & Tanko (B.). **Versuche über die Wirkung von Kalkarsenaten auf die Schwebefähigkeit der Kupferkalkbrühe.** [Experiments on the Effect of Calcium Arsenate on the Suspension Capacity of Bordeaux Mixture.]—*Neuheiten PflSch.* **31** pt. 5 pp. 199–203, 2 diagr., 6 refs. Vienna, 1938.

The results are given of experiments on the effects of five different samples of calcium arsenate on the suspension capacity of Bordeaux mixture. It was found that calcium arsenates that form a good suspension in water reduce the time that the Bordeaux mixture remains in suspension, while those that form a poor suspension in water increase it.

Enser (K.). *Brotolomia meticulosa* **L. als Schädling an Gewächshauszyklamen.** [*B. meticulosa* as a Pest of *Cyclamen persicum* in Greenhouses.]—*Neuheiten PflSch.* **31** pt. 5 pp. 203–204, 1 fig. Vienna, 1938.

In the autumn of 1937, the leaves and stems of *Cyclamen persicum* in a greenhouse near Vienna were found to be injured by the larvae of *Brotolomia meticulosa*, L., which has not previously been recorded as a pest of plants of this genus. The larvae are described. Individuals collected on 21st November entered the soil on 9th December to pupate, and the first adult emerged on 30th January. A list of food-plants of this Noctuid is given from the literature.

Isaakidès (C. A.). **Une chenille arpenteuse nuisible à l'olivier d'Hiérapetra, en Crète** (*Erannis* (*Hybernia*) *bajaria* **Schiff. ab.** *sorditaria* **Hübn.**).—*Ann. Inst. phytopath. Benaki* **2** fasc. 2 pp. 65–78, 8 pls. Athens, 1936.

Descriptions are given of all stages of a Geometrid of the genus *Erannis* that has been established in the plain of Hiérapetra in eastern

Crete for more than 60 years and causes serious injury to olives. Adults reared in 1929 were identified as *Erannis bajaria*, Schiff., but from more extensive studies in subsequent years, it appears that the form concerned is *sorditaria*, Hb. This is usually considered an aberration of *bajaria*, but though the known area of distribution of the latter includes Crete, it has not been recorded from olives. From a study of the wing venation of the males of the species of *Erannis* and their aberrations, the author divides them into three groups; *leucophaearia*, Schiff., is the only species of the first group, while *bajaria* is among those in the second. The venation of *sorditaria* is intermediate in character, but the author considers that it should be regarded as an aberration of *leucophaearia* and not of *bajaria*.

In Crete, the adults begin to emerge from the soil in January, and the females, which are apterous, crawl up the olive trees, climbing at most 7 ft. Emergence continues until the end of February or beginning of March. The females lay 220–280 eggs in groups of 60 or less in cracks of the bark. The larvae first appear between 10th and 20th March. They eat the young buds in the axils of the leaves and later the flower buds and young leaves, but never the open or faded flowers. The larval stage lasts 35–40 days. Pupation takes place in the soil under the trees at a depth of about 2 ins. Infestation is confined to olives. Irrigated groves are not infested, presumably because the pupae are destroyed in the damp soil, and ploughing the groves in August exposes the pupae to the prevailing strong dry wind, which kills them. In 1903, growers were compelled to collect larvae by shaking them from the branches of the olive trees on to sheets stretched beneath. In 1906, adhesive bands were introduced, but were not satisfactory as they dried quickly, injured the trees and became so covered with the bodies of the females caught that others crawled over on them. In 1909, one application of a spray of 5 lb. Paris green, 20 lb. quick lime and 100 gals. water in March or April was recommended. This spray is still used and is successful if correctly timed. It was considered too costly in 1930, when the price of olive oil was low, and a spray of half the strength was tried and found to be practically as effective. Annual spraying would be necessary to eradicate the pest, but this is too costly. Only groves in which infestation is very heavy in one year are sprayed during the next. Light traps to destroy the males were tried in 1930, but without success. Natural enemies, including the Pteromalid, *Conomorium eremita*, Först., the Braconids, *Apanteles difficilis*, Nees, and *Zele* (*Phylacter*) *calcarator*, Wesm., and an Ichneumonid, *Platylabus* sp., exercise considerable control.

CANDURA (G. S.). **Studi sugli insetti dannosi ai semi e ai viveri nella Venezia Tridentina. I. Comportamento biologico della** *Plodia interpunctella* **Hb.** [Studies on Insects harmful to Grain and Foodstuffs in the Trentino. I. The Biology of *P. interpunctella*.]—*Studi trentini* **18** no. 3 pp. 263-315, 8 pls., 13 pp. refs. Trento, 1937.

The chief pests of stored products in North Italy are *Plodia interpunctella*, Hb., *Ephestia kuehniella*, Zell., *Tinea granella*, L., and *Sitotroga cerealella*, Ol. The author has investigated their bionomics in the region of Bolzano for several years, and here gives the results of

his work on *P. interpunctella*, which he bred in various substances in an unheated room, the temperature of which approximated to those of ordinary storerooms.

Near Bolzano, adults are generally present from early May until December. They usually pair on the day of emergence, some individuals dying in the process. The oviposition period, which begins up to 4 days after emergence, usually lasts 2–3 days, but may extend to 5. When the moths were kept in pairs without food in glass tubes, the number of eggs deposited per female varied from 3 to 275 and averaged 128·2 ; 28 per cent. of the females deposited 51–100 eggs, and 24 per cent. 101–150. The average number of eggs deposited in the months May–September fell gradually from 155 to 113·2. Of 250 pairs of adults placed in tubes with various substances, only 25 per cent. gave rise to adult progeny and 52 females did not oviposit, this being due in some cases to the death of the male while pairing, which the author considers to be fairly common in nature when the male has paired more than once.

The larvae hatched in 3–18 days and pupated in 1–10 months, the period depending on nutrition. The length of the pupal stage varied from 10 days in August to 1 or 2 months in autumn and winter. *P. interpunctella* generally hibernates as a full-fed larva in the cocoon. Males were 5 times as numerous as females. The number of generations, which overlapped considerably, varied from 1 to 4 per year, according to the substance attacked. It was 3 or 4 in chestnut flour, 3 in dried chestnuts, soft grains, wheat flour, rye, maize-flour, shelled and unshelled ground-nuts, soy-bean flour, dried plums, dried carrots and other dried vegetables, and generally only 2 in chocolate, linseed, beans, dried peas, dates, and dried cherries.

Adults and larvae of *P. interpunctella* were attacked by fungous diseases, and adults of *Tenebroides mauritanicus*, L., were predacious on the larvae. Females of the parasite, *Nemeritis canescens*, Grav., oviposited in the larvae, the adults emerging from the dead host and surviving for up to three months when fed on sugary substances [*cf. R.A.E.*, A **24** 555]. Oviposition continues throughout adult life. Parthenogenetic reproduction occurred, up to 100 adult progeny being obtained from an unfertilized female. One female oviposited in September in 10 host larvae within an hour of emergence, the adults emerging after 53 days. Larvae of *P. interpunctella* in dried chestnuts are particularly attractive to the parasites. Males were rare in the author's cultures ; the progeny of a female were either all male or all female, and this did not apparently depend on fertilisation [*cf.* **25** 263]. *N. canescens* hibernated as a larva within the host, the adults emerging in the following spring.

The author briefly discusses the control of infestation by *P. interpunctella* and concludes that the best method is by cold storage. Dried food-stuffs in shops should always be kept in closed containers.

MARTELLI (M.). **Gli insetti più esiziali alle colture di canapa.** [The Insects most important to Hemp Crops.]—15 pp., 4 figs. Bologna, Consorz. Dif. Canapicolt., 1938.

This paper is based on a memoir by Goidanich [*R.A.E.*, A **17** 330] on the insect fauna of hemp in Italy. The species of importance are those mentioned in another paper by him [**19** 330].

Martelli (M.). **Contributi alla conoscenza dell'entomofauna del granoturco** (*Zea mays* **L.**]. **I. Nota preliminare.** [Contributions to the Knowledge of the Insect Fauna of Maize. I. Preliminary Note.]—*Boll. Ist. Ent. Bologna* **10** pp. 139–166, 5 pls., 46 refs. Bologna, 15th August 1938.

Lists are given of 55 species of insects previously recorded from maize in Italy and of 29 observed by the author in Emilia and Romagna with notes on the bionomics of some of the latter and on the parasites of a few of them. The two lists have only 3 species in common. The chief pest was *Pyrausta nubilalis*, Hb. In addition to some of the parasites noted by Goidanich [*R.A.E.*, A **20** 446], the author bred *Centeterus* sp. from this Pyralid, no species of the genus having hitherto been recorded from it. This Ichneumonid is a solitary, endophagous parasite, of which the larva pupates in the pupa of the host, the adult emerging in early August. The Noctuid, *Sesamia cretica*, Led. [*cf.* **23** 520] was the only other important pest of maize, but unidentified wireworms were occasionally injurious.

Ghidini (G. M.). **Le termiti dell' Africa orientale italiana e loro importanza economica.** [The Termites of Italian East Africa and their economic Importance.]—*Riv. Biol. colon.* **1** fasc. 3 pp. 221–235, 4 figs., 14 refs. Rome, June 1938. (With Summaries in English, French and German.)

This is a brief survey of the termites that have been recorded in Italian East Africa, with notes on the distribution of some of them in Africa as a whole, their habits and the kinds of damage that they are capable of causing.

Antongiovanni (E.). **La lotta contro il verme rosa del cotone** (*Platyedra gossypiella*) **per mezzo della fumigazione del seme con vapori di acido cianidrico.** [Control of the Pink Bollworm of Cotton, *P. gossypiella*, by Fumigation of the Seed with Hydrocyanic Acid Gas.]—*Boll. Cotoniera* 1938 no. 9 repr. 7 pp., 7 figs. Milan, 1938.

Cotton is an important crop in Sicily, and the fumigation of cotton seed with hydrocyanic acid gas against *Platyedra gossypiella*, Saund. [*cf. R.A.E.*, A **25** 285] is compulsory in the province of Catania. An account is given of fumigation effected from March to June 1938 in a provisional installation at normal air pressure, in which the gas was generated from sodium cyanide by the pot method and about 170 tons of seed was treated either in chambers built of masonry or in a bag of impermeable fabric. In the bag, the seed was placed in four trays, about 8 ft. long and 3 ft. wide, arranged in pairs one above the other. Each had a bottom of wire screen and four short legs to raise it off the ground or off the lower tray. In the fixed chambers, the seed was exposed in layers or was in bags. Several experiments were made and are described in detail. It was found that the layer of seed must not be more than 8 inches deep and that it must rest on a wire screen giving the gas access from below as well as from above. With such layers, 5–6 oz. sodium cyanide per 100 cu. ft. will give good results in 3 hours, though it is doubtful whether complete control can be obtained without vacuum fumigation. No decrease in germination power was observed in the

treated seed. Cotton seed absorbs a good deal of gas, which it releases quickly. To avoid the need for ventilation between treatments, the author recommends that the chambers be small enough for the trays to be introduced and removed by an operator standing outside.

CHIAROMONTE (A.). **Note di entomologia etiopica : l'assenza di** *Stephanoderes hampei*, **Ferr., nelle coltivazioni di caffè.** [Notes on Ethiopian Entomology : the Absence of *S. hampei* in Coffee.]—*Agric. colon.* **32** no. 9 pp. 398–399. Florence, 1938.

Samples of coffee received from the governments of Galla and Sidama, Amara, and Eritrea were found to be free from *Stephanoderes hampei*, Ferr., and it is suggested that quarantine measures be taken to prevent the introduction of this Scolytid into Italian East Africa.

CARNÉRI (A.). **Une nouvelle plante nourricière pour l'***Acherontia atropos* **L. (Lépidoptère-Sphingide).**—*Misc. ent.* **39** no. 8 pp. 70–71. Castanet-Tolosan, 1938.

A Sphingid larva collected in northern Egypt was given to the author at the end of March 1938 on a branch of olive on which it was said to have been taken. It fed on olive in the laboratory for more than a week, pupated on 6th April and gave rise to a typical male adult of *Acherontia atropos*, L.

STANLEY (J.). **The Egg-producing Capacity of Populations of** *Tribolium confusum* **Duv., as affected by intensive cannibalistic Egg-consumption.**—*Canad. J. Res.* (D) **16** no. 10 pp. 300–306, 5 figs., 2 refs. Ottawa, 1938.

In view of the possibility that the rate of oviposition in females of *Tribolium confusum*, Duv., was seriously reduced as a result of a deficient consumption of wheat germ in populations in which the eggs were eaten as rapidly as laid, investigations were made on populations of the beetle kept at 27°C. [80·6°F.] and 75 per cent. relative humidity in different flour media and in flour to which 3 per cent. ground wheat germ had been added. The details of the method are described, and the results are shown on graphs. In ordinary sifted whole-wheat flour, there was very little diminution in egg-production and all the beetles were alive and thriving after 30 days. When 30 eggs per gm. flour were added, at intervals, there was a sharp decline in egg-production, the beetles became sluggish and showed premature signs of age, and the reproductive tracts of the only 4 females alive after 30 days had suffered a remarkable degeneration. When 50 eggs were added per gm. flour these effects were intensified.

The decline in egg-production was only slight in flour with the addition of wheat germ, and still less, although greater than in the first test, when 135 eggs per gm. were also added, possibly owing to a better supply of water being obtained from the eggs.

STRICKLAND (E. H.). **The Chermidae (Homoptera) of Alberta.**—*Canad. Ent.* **70** no. 10 pp. 200–206, 8 refs. Orillia, 1938.

A list is given of 27 species of Psyllids collected in the neighbourhood of Edmonton in 1937, showing the plants on which they were found. Two undescribed species were also taken. The collection was made

as a result of the discovery of Psyllid yellows in potatoes, accompanied by a local infestation of *Paratrioza cockerelli*, Šulc, in a city garden in Edmonton in 1936.

P. cockerelli is thought to have been present on greenhouse tomatos in Alberta in 1928, but it was not definitely identified there until 1934, when Psyllid yellows became prevalent in potato in a number of places in the south [*cf. R.A.E.*, A **22** 690]. It was probably introduced with infested greenhouse plants and escapes into the field each year, being unable to overwinter in the open.

FARSTAD (C. W.). **Thelyotokous Parthenogenesis in** *Cephus cinctus*, **Nort., (Hymenoptera : Cephidae).**—*Canad. Ent.* **70** no. 10 pp. 206–207, 1 ref. Orillia, 1938.

Cephus cinctus, Nort., first caused appreciable damage to wheat in the Nobleford-Lethbridge area of southern Alberta in 1934, and has increased and spread rapidly each year, causing as much as 75–80 per cent. loss of crop. No males have been found among the large numbers of adults and hibernating larvae collected since 1935, whereas the sexes occur in practically equal numbers in all other districts in which this Cephid is established. In experiments, larvae, apparently normal, hatched from 92 per cent. of 117 eggs laid by females from this district, and from unfertilised eggs laid by females reared from material from a district in which both sexes occur.

A. D. Peacock has stated in correspondence that cytological studies of the spermatogonia indicate that the closely related species, *C. pygmaeus*, L., is arrhenotokously parthenogenetic. He further suggests, however, that parthenogenetic reproduction in this species may be arrhenotokous in Europe and thelyotokous in Canada, as it is in *Diprion polytomum*, Htg. [*cf. R.A.E.*, A **26** 215]. The present study suggests that unfertilised females of *C. cinctus* are thelyotokous in Alberta, even where males occur. The increased biotic potential of the insect in their absence probably explains the rapid increase of infestation in the Nobleford-Lethbridge area ; dissection has shown that the females contain as many eggs in this district as they do in others.

BRITTON (W. E.). **Regulations concerning Transportation of Nursery Stock in the United States and Canada.**—*Circ. Conn. agric. Exp. Sta.* no. 125 pp. 77–105. New Haven, Conn., 1938.

The regulations that may affect Connecticut nurserymen wishing to export stock to other states are summarised, and digests of the Federal quarantines affecting the transport of nursery stock, and the regulations of the District of Columbia and the Dominion of Canada are included.

SLATE (W. L.). **Entomology.**—*Bull. Conn. agric. Exp. Sta.* no. 409 pp. 291–301. New Haven, Conn., 1938.

Much of the information on insect pests in this bulletin, which constitutes the report of the Connecticut Agricultural Experiment Station for the year ending 31st October 1937, has already been noticed [*R.A.E.*, A **26** 218, 722–725]. Studies on the parasitism of *Rhyacionia buoliana*, Schiff., showed that the native Eulophid, *Hyssopus thymus*, Gir. [*cf.* **24** 429], which has several generations a

year, is quite common and can maintain itself on this host alone. The Braconid, *Orgilus obscurator*, Nees, which also parasitises the larvae, has been established in infested stands of red pine [*Pinus resinosa*], and in one of these a parasitism of 20 per cent. was observed in the spring of 1937 [*cf.* **26** 745]. Two applications at the most of a spray consisting of 4 lb. derris or cubé powder and 3 lb. fish oil as an adhesive in 100 U.S. gals. water gave good control of *R. buoliana*; this spray was more effective than one containing 3 lb. lead arsenate and fish oil [*cf.* **24** 429]. In experiments on the control of *Epitrix cucumeris*, Harr., on potato, a cubé dust (0·75 per cent. rotenone content) was more effective than a spray of 1 lb. pure ground cubé root (4 per cent. rotenone) in 25 U.S. gals. water or a dust of barium fluosilicate and hydrated lime (1 : 4); the addition of a petroleum sulphonate (Ultrawet [**26** 285]) to the cubé dust (1 : 1000) increased its effectiveness and reduced the feeding of the beetles.

Morrill (A. W.) & Lacroix (D. S.). **Report on the Insect Investigations for the 1937 Season.**—*Bull. Conn. agric. Exp. Sta.* no. 410 pp. 444–449, 2 figs., 1 ref. New Haven, Conn., 1938.

Experiments against pests of tobacco in the Connecticut River Valley in 1937 included some in which experimental plots were dusted in shade tents with a mixture of cubé root powder and tobacco dust (1 per cent. rotenone), with or without clay, and a 4 : 1 mixture of barium fluosilicate and either tobacco dust or cubé root powder (about 5 per cent. rotenone), each being applied 7 times at weekly intervals at rates that varied from 6 to 10 lb. per acre according to the size of the plants, beginning on 4th June, for the control of *Epitrix cucumeris*, Harr. About equal control was given by each of the dusts, the losses in treated and untreated plots averaging 4·4 and 24·3 per cent., respectively. Dusts containing barium fluosilicate left an objectionable white residue on the leaves in some cases. Observations on variations in attractiveness of the plants to the beetles indicated that those richer in calcium were preferred. Tests carried out in an insect-proof cage that covered a number of plants showed that although *E. cucumeris* developed in the soil of tobacco shade tents, most of the beetles entered from the edges of the field; the majority of these had apparently migrated from surrounding potato fields after the application of insecticides or fungicides.

Frankliniella fusca, Hinds, was unusually abundant on tobacco where the soil was dry and sandy; it was not found, however, in heavy, moist soils. Although tests on its control were inconclusive, the best protection was given by a cubé dust (1 per cent. rotenone) at the rate of 12 lb. per acre, using a spreader (sulphonated phenyl phenol, 1 : 200). A spray of 12 lb. cubé root powder (1 per cent. rotenone) in 50 U.S. gals. water, with the spreader (1 : 400), was more effective than sprays containing nicotine sulphate (1 : 400) mixed with molasses and soap or with Karaya gum.

Wireworms, chiefly *Pheletes ectypus*, Say (*Limonius agonus*, Say) cause considerable injury to young tobacco plants in the Connecticut River Valley. Of various repellents and fumigants that were added to the setting water when the tobacco was planted out, carbon bisulphide emulsion with dissolved naphthalene, zinc arsenate, and dichlorethyl ether all gave good results. The dichlorethyl ether was the most effective and remained repellent for a long time, but it scorched

the plants in warm weather. Plots in which crude flake naphthalene, at the rate of about 800 lb. per acre, was ploughed into the soil immediately before planting contained an average for the season of 0·47 wireworms per cu. ft., in comparison with 1·65 in the untreated plots. No satisfactory results were obtained when various fumigants were applied to the soil after the plants were set.

Other pests of tobacco included *Melanoplus femur-rubrum*, DeG., and *Dissosteira carolina*, L., on sun-grown types, *Euxoa messoria*, Harr., particularly where no poisoned-bran bait was used at setting time, and *Polia legitima*, Grote, which caused serious injury to seed beds in one locality during May. *Protoparce quinquemaculata*, Haw., and *P. sexta*, Joh. [*cf. R.A.E.*, A **26** 726] were heavily parasitised by *Apanteles congregatus*, Say.

BAERG (W. J.) & ISELY (D.). **Entomology.**—*Bull. Arkansas agric. Exp. Sta.* no. 351 (Rep. 1936-37) pp. 42–45. Fayetteville, Ark., 1938.

Though the winter of 1936-37 had been mild in Arkansas, no live larvae, pupae or adults of *Tyloderma fragariae*, Riley, were found in the crowns of infested strawberry plants in March. Their failure to survive the winter shows that plants moved in early spring will not carry any stage of the weevil, provided that they are shaken to remove soil, which may contain adults. The egg stage lasted 9–14 days in summer, and the pupal stage 5–9, while the larval stage of a single individual lasted 19 days. *T. foveolata*, Say, was fairly common in strawberry beds in two localities [*cf. R.A.E.*, A **25** 623]; it feeds readily on the leaves and crowns of strawberry, but adults under observation laid no eggs when kept on this diet.

It has been found that damage to maize by *Euetheola rugiceps*, Lec., may be prevented by planting early, if the temperature is not too low for reasonable growth, or late (about 1st June), when the beetles are no longer active.

In 1936, grasshoppers became an important pest for the first time in Arkansas, though there had been local injury near pasture land in previous years. The outbreak, which was largely confined to the northern counties, was probably due to a succession of hot dry summers and the absence of spring rains in 1936, and to the increase in pasture land. About 80 per cent. of the damage, including all the damage to maize in some fields, was caused by *Melanoplus differentialis*, Thos., but *M. mexicanus*, Sauss., and *M. femur-rubrum*, DeG., were also important on grassland.

Young apple trees are often killed by *Chrysobothris femorata*, Ol., but can be protected by wrapping the trunks and branches in paper during the oviposition period. Of 100 one-year-old replanted trees wrapped in newspaper from early April until late September, only 3 were infested. Eight trees left unwrapped in the same orchard were all attacked.

HANSON (A. J.) & WEBSTER (R. L.). **Insects of the Blackberry, Raspberry, Strawberry, Currant, and Gooseberry.**—*Pop. Bull. Wash. agric. Exp. Sta.* no. 155, 38 pp., 27 figs., 9 refs. Pullman, Wash., April 1938.

Brief notes are given on the bionomics and control of 25 species of insects and 4 species of mites that attack blackberries, raspberries,

strawberries, or currants and gooseberries in the Puget Sound region of Washington, and on the appearance of most of them and the kinds of injury they cause. A list of other minor pests or non-injurious insects collected on strawberries, blackberries and raspberries is appended.

PEPPER (B. B.). **Insecticides to control the European Corn Borer on Sweet Corn.**—*Circ. N. J. agric. Exp. Sta.* no. 377, 4 pp. New Brunswick, N.J., 1938.

Recommendations, based mainly on the results of experiments in New Jersey in 1936 and 1937 and on similar work in Connecticut [*R.A.E.*, A **25** 769], are made for the use of insecticides against *Pyrausta nubilalis*, Hb., on sweet maize. Control is justified only if damage is considerable; where the two-generation strain of borer occurs, it is particularly important to protect the early and late plantings, as these are severely injured by larvae of the first and second generations, respectively. Effective control is obtained if the spaces between the leaves in the growing centre of the plant, where the young larvae feed for some time, are kept filled with insecticide. The growing centres of the main stalks and tillers must be treated 4 or 5 times at intervals of 5 or 6 days, beginning when the first eggs hatch. If, as usually occurs, the ears are starting to develop when the last application is made, they should be covered with insecticide to prevent entry by migrating larvae.

It is necessary to use a wetting agent in both dusts and sprays. Of those tested, only butyl phenyl-phenol sodium sulphonate, a dry powder readily soluble in water, was satisfactory; it is used at the rate of 1·6 oz. per 100 lb. in the dusts and 5 oz. per 100 U.S. gals. in the sprays. The dusts recommended consist of 7 lb. nicotine sulphate and 93 lb. finely powdered bentonite clay, or 19 lb. finely ground derris or cubé root (yielding 4 per cent. rotenone and 16 per cent. or more total extractives) and 81 lb. talc (or 56 lb. talc and 25 lb. dusting sulphur). The nicotine dust is slightly more effective than the others, but is less easily mixed. These dusts should be applied at the rate of 25–30 lb. per acre. Dusting appears to be more practical than spraying, but consistently good results have been obtained with sprays of 4 lb. derris or cubé root (as above), or 1 pint nicotine sulphate and 5 lb. bentonite, in 100 U.S. gals. water.

BARBER (G. W.). **The Concentration of *Heliothis obsoleta* Moths at Food. (Lepidoptera : Noctuidae).**—*Ent. News.* **49** no. 9 pp. 256–258. Philadelphia, 1938.

Observations in Georgia in 1933 and South Carolina in 1934 suggest that, when maize is not at an attractive stage of growth, adults of *Heliothis armigera*, Hb. (*obsoleta*, F.) concentrate for food in fields of plants that are in flower, which attract them in numbers and from a distance proportional to the abundance of blossom. They lay eggs on the plants, although these may not be preferred or usual food-plants, and this may lead to unusually severe injury when the larvae hatch and begin to feed.

In Georgia, for a fortnight from the third week in September 1933, after the maize had ripened, the moths concentrated in great numbers in a 100-acre field of late flowering soy beans and oviposited on them;

hardly any could be found on neighbouring fields in which the soy beans were older and bore less bloom, though they would have provided suitable food for the larvae. In South Carolina, larvae of *Heliothis* occurred on early-planted flax in May, but when the moths emerged during the first week in June, they practically all migrated to one field of late-planted flax that was at the height of blossoming. At this time the flax in the other fields had little blossom but plenty of capsules suitable as food for the larvae. The moths stayed among the late flax plants for about 10 days and oviposited on them, ignoring maize 12-18 ins. high in the vicinity, which would normally have attracted them for oviposition. The resulting larvae caused considerable damage to the flax.

Barry (J. J.). **Division of Entomology and Plant Industry.**—*Rep. Dep. Agric. Conserv. Rhode I.* 1935 pp. 39-74 ; 1936 pp. 45-90 ; 1937 pp. 53-92. Providence [R. I.], 1936-38.

The duties of the Division of Entomology and Plant Industry of Rhode Island include the prevention of the distribution of injurious insects through nursery stock, the control of the gipsy and brown-tail moths [*Lymantria dispar*, L., and *Nygmia phaeorrhoea*, Don.], the corn borer [*Pyrausta nubilalis*, Hb.], the Japanese beetle [*Popillia japonica*, Newm.] and mosquitos, and inspection for Dutch elm disease [caused by *Ophiostoma ulmi*]. It also functions as a bureau of information, identifying insects submitted to it and suggesting means of control. These three reports comprise accounts of the routine work carried out under these headings during 1935-37. Dutch elm disease has not yet been found in the State. A few winter nests of *N. phaeorrhoea* were discovered in 1936 ; this was the first record of the moth since 1916. It was not observed in 1937.

Hunt (G. M.) & Snyder (T. E.). **An International Termite Exposure Test.—First Progress Report.**—*Proc. Amer. Wood Pres. Ass.* **26** pp. 318–334, 5 refs. Baltimore, Md., 1930. **Ninth Progress Report.**—*Op. cit.* **34** pp. 301–315, 4 figs. Washington, D.C., 1938.

In the first of these annual reports, an account is given of the inauguration of a large scale experiment on the effectiveness of different chemicals in preserving wood against termites. Pieces of air-seasoned sap pine about $2 \times 4 \times 18$ ins. were used, and 4 complete sets of specimens were prepared, one of which was installed in the Panama Canal Zone, one in Canberra, Australia, one in Hawaii and one in South Africa. The results of three inspections are given.

In the other report, data on the condition of specimens after exposure for 4–9 years are given in tables. It is emphasised that only preservatives with a high resistance to leaching can be depended upon to protect wood in contact with the soil and exposed to the weather in a damp climate, and that the tests do not indicate the effectiveness of preservatives for protecting wood in buildings where there is no exposure to leaching. The tests are expected to continue for many years, and it is stated that, in the meantime, the use of data so far published for the commercial exploitation of a preservative is not warranted.

EDWARDS (W. H.). **Some Insects injurious to Trees generally grown in the Gardens of Jamaica.**—*J. Jamaica agric. Soc.* **42** no. 9 pp. 393–396, 3 figs. Kingston, Jamaica, September 1938.

The roots and stems of young trees are often attacked in Jamaica by June beetles [*Lachnosterna*] and their larvae; they are attracted by decaying vegetable matter, farm-yard manure and rotting wood. Larvae of *Lyncestis acontioides*, Gn., sometimes crawl up the trunks of *Poinciana* at night to feed on the leaves, and those of *Oiceticus abboti*, Grote, occur in destructive numbers on *Citrus* and other trees, which they may defoliate in a few days. The branches of ornamental trees are often severed by *Oncideres amputator*, F. [*cf. R.A.E.*, A **14** 148].

EDWARDS (W. H.). **The Protection of Lumber used for the Erection of Settlers' Houses, Barns, and other Rustic Woodwork against Decay, and Attack of Wood-boring Insects.**—*J. Jamaica agric. Soc.* **42** no. 9 pp. 409–411, 413. Kingston, Jamaica, September 1938.

Notes are given on methods of treating wood used for the construction of rural dwellings, sheds and garden accessories in Jamaica to protect it from fungi and wood-boring insects. Wood for piles should be barked and exposed to the sun as soon as it is felled so that it dries rapidly and does not become infested. Unbarked wood can be protected from borers by spraying it repeatedly with a mixture of 1 part coal-tar creosote and 3 parts fuel oil or kerosene, and all unpainted wood used in the construction of buildings should be immersed in this mixture. Cut bamboo is often bored by *Dinoderus minutus*, F., and should be soaked in water for a few days when freshly cut to dissolve the sugars, carbohydrates and albumen that attract the beetle.

The termites that are injurious in rural areas are subterranean [*cf. R.A.E.*, A **27** 56]. Piles can be permanently protected from them by a capping made of sheet metal soldered at the edges. The capping should project 4 ins. above the ground, and half the width of the projecting edge should be bent downwards at an angle of 45 degrees. Subterranean termites may be killed in large numbers by crushing a few individuals with a poisonous powder (Paris green, arsenic or mercurous chloride) and inserting them into nests and runways; they are then eaten by others, which thus become poisoned and poison those that eat them.

EDWARDS (W. H.). **The Control of Insects which attack wooden Furniture.**—*J. Jamaica agric. Soc.* **42** no. 10 pp. 454–458. Kingston, Jamaica, October 1938.

Among the many insects other than termites that infest furniture in Jamaica the commonest are *Lyctus tomentosus*, Reitt., *Xyleborus perforans*, Woll., and *Dinoderus brevis*, Horn, which attack the sapwood of cedar, coconut boards and bamboo, respectively. If insects are in boards not more than an inch thick, they can be killed by submitting the infested material to a temperature of 175°F. for one hour. Fumigation with hydrocyanic acid gas or carbon bisulphide under a partial vacuum is effective, but difficult to apply. Impregnation of infested wood with a liquid insecticide is the most practical method of control under local conditions. The mixture is prepared by placing 2 oz. paradichlorobenzene, 2 fl. oz. kerosene and 2 fl. oz.

petrol in a pint bottle. When the crystals have dissolved, 2 fl. oz. orthodichlorobenzene are added and the bottle is filled with turpentine. The petrol with paradichlorobenzene in solution evaporates quickly and kills all the insects reached by the fumes, and the orthodichlorobenzene and turpentine soak into the wood and prevent re-infestation. Treatment should be repeated two or three times at fortnightly intervals.

Box (H. E.). **Observations on Sugar-cane Moth Borers** (*Diatraea* **spp.) in St. Lucia.—III. The Introduction and Establishment of the Amazon Fly** (*Metagonistylum minense* **Townsend) and Control of** *Diatraea saccharalis* **Fabricius by means of this Parasite. Report upon a Visit to St. Lucia, March–April, 1938.**—Fol. 25 pp., 11 refs. Castries, St. Lucia, B.W.I., September 1938.

This paper constitutes a detailed account of work in St. Lucia in 1933–38 on the biological control of *Diatraea* spp. on sugar-cane, preceded by a description of the conditions under which the crop is grown. *D. saccharalis*, F., and *D. canella*, Hmps., are the only moth-borers present; *D. lineolata*, Wlk., was reported previously [*R.A.E.*, A **22** 104] owing to misidentification. *D. saccharalis* was abundant wherever its food-plants occurred and infested many more plant canes than ratoons, whereas *D. canella* was abundant only in districts with a comparatively high rainfall and showed a preference for ratoons. Notes are given on the life-history and type of injury caused [*cf.* **16** 462], alternative food-plants, and natural enemies [**21** 410; **22** 104]. The Tachinid parasite, *Lixophaga diatraeae*, Tns., was introduced from Antigua in 1934 [**22** 104]; it could not be reared on *D. canella*, and no instance of parasitism of this species was observed in the field. The Tachinid became established and was effective against *D. saccharalis* for a time in one of the wettest sugar-cane districts as well as in one with intermediate rainfall; by the beginning of 1936, however, it had diminished to negligible proportions and was of no further use in control. It did not parasitise *Diatraea* in food-plants other than sugar-cane.

In November 1934, a consignment of puparia of *Metagonistylum minense*, Tns., was received from British Guiana [*cf.* **26** 491] and in December fertilised females were liberated in one district; further liberations were subsequently made in others. Studies on the life-history [*cf.* **22** 388, 567] showed that the larval and pupal stages lasted 5–8 and 7–14 days, respectively, and a period of 7–8 days elapsed between pairing and larviposition. Only one generation was reared in the laboratory, as it was found more economical to recover the progeny of the females that were liberated in the field. Surveys carried out in 1935, 1936 and 1938 showed that the rate of spread was phenomenal. By 1938, the Tachinid was thoroughly established in the four main sugar-cane centres, and the colonisation of the island was almost complete. The percentage parasitism of *D. saccharalis* averaged 40 in the wetter districts, but was less in the drier areas; it frequently exceeded 50, and even reached 75, where host material was abundant. Of larvae of *D. canella*, however, only 2·67 per cent. were visibly attacked, and only 3 per cent. of these were completely parasitised. The infestation of canes by the two species was reduced by about 50 per cent. as a result of control of *D. saccharalis*, though infestation by *D. canella* appeared to increase in plant fields, and was not

significantly decreased in ratoons. It is not considered probable that this increase in infestation will assume serious proportions, but the introduction of a specific parasite is considered desirable. The only efficient Dipterous parasite known that attacks *D. canella* is *Stomatodexia diadema*, Wied.; it occurs widely in South America, and although it normally parasitises *D. saccharalis*, it has been known, under favourable conditions and in the absence of *D. saccharalis*, to parasitise up to 33 per cent. of the larvae of *D. canella* in Trinidad. If it were established in St. Lucia, it would probably have no effect on the more efficient *Metagonistylum*, so far as competition for *D. saccharalis* as a host is concerned [*cf.* **22** 566]. The danger of introducing a hyperparasite among Dipterous puparia imported from Trinidad or South America should be avoided by the importation of adult flies only.

In the summer of 1935, it was evident that *Lixophaga* was diminishing in Antigua [*cf.* **25** 616], and an attempt was made to establish *Metagonistylum* against *D. saccharalis* there. This, however, was unsuccessful.

DA COSTA LIMA (A.). **Sobre dois Calcidideos parasitos de larvas de Curculionidae.** [Two Chalcidoid Parasites of Curculionid Larvae.] —*Mem. Inst. Osw. Cruz* **33** pt. 2 pp. 329-332, 1 pl. Rio de Janeiro, 1938.

Descriptions are given of the females of the Pteromalids, *Eurydinoteloides gahani* and *E. montei*, spp. n., which are parasites of the larvae of *Tyloderma brassicae*, Costa Lima, and *Callabismodes tabaci*, Mshl., respectively, in Brazil.

BUTAC (F. L.). **Life History and Habits of the Cotton Bollworms in the Philippines with Suggestions for their Control.**—*Philipp. J. Agric.* **9** no. 2 pp. 137-151, 4 pls., 9 refs. Manila, 1938.

An account is given of observations in 1935 and 1936 on the bionomics of *Earias fabia*, Stoll., *E. chromataria*, Wlk., and *Platyedra* (*Pectinophora*) *gossypiella*, Saund., attacking cotton in the Philippines, and all stages of each are described. All of them were reared in the laboratory at an average temperature of about 30°C. [86°F.].

The two species of *Earias* were similar in habits. The egg, larval and pupal stages of *E. fabia* were completed in 2–4, 11–17 and 8–11 days, and those of *E. chromataria* in 4, 20–21 and 7–12 days. The adults lived for up to 4 weeks. The eggs were laid singly on or near the terminal buds, or on flowers or bolls, at night, and began to hatch just before the flower buds showed. The larvae bored into the stems and branches of the young plants from the buds, moving from shoot to shoot, but preferred flower buds, flowers or bolls when these were present. They hollowed out the buds, fed only on the anthers of open flowers, and ate the seeds in the bolls, incidentally damaging the lint. They pupated in cocoons attached to the petioles and branches of the plant or to the bracts of the bolls.

The egg, larval and pupal stages of *P. gossypiella* lasted 4–6, 14–25 and 5–9 days in the laboratory, and the adults lived for 7–25 days. The moths were active at night, and the females laid their eggs on bolls, squares and flower buds and under the leaves. The larvae fed on buds and flowers, and later in the bolls of both cultivated and wild cotton; they pupated in the bolls, after making exit holes. Some

of the larvae in the harvested cotton, however, had enclosed themselves by fastening together two hollow seeds, and remained quiescent for up to 5 months and 11 days. Since these long-cycle larvae were not destroyed by ginning, they would be stored with the seeds for the next planting, and would give rise to adults when conditions were favourable. The adults from wild cotton and those from plants left in the field after harvest continued their breeding on these.

For the control of these bollworms, shoots and early bolls showing signs of attack should be destroyed, and all species of cotton, as well as *Hibiscus esculentus* (which is known to be a food-plant of *E. fabia* in the Philippines), should be pulled up and burnt after harvest. Early matured bolls infested with *P. gossypiella* should be picked and fumigated with carbon bisulphide or with a mixture of ethylene dichloride and carbon tetrachloride, and all seeds for planting should be fumigated or dried well and then stored in tightly closed containers. A dust mixture containing 50 per cent. derris with a rotenone content of about 3 per cent. killed all larvae of *E. fabia* in the laboratory, and, in a field experiment in which it was tested with promising results against *Cosmophila* sp. on cotton, it also killed larvae of *E. fabia* and adults of *Dysdercus cingulatus*, F. (*megalopygus*, Bredd.) and *Amorphoidea lata*, Motsch., but not larvae of *Prodenia litura*, F.

Pupae of *E. fabia* and *P. gossypiella* were found parasitised by *Brachymeria* sp., and eggs of *E. fabia* and *E. chromataria* were readily attacked experimentally by the introduced parasite, *Trichogramma minutum*, Riley [*cf. R.A.E.*, A **23** 709].

EVANS (J. W.). **Insect Pests and Plant Quarantines.**—*J. Aust. Inst. agric. Sci.* **4** no. 3 pp. 124–130, 11 refs. Sydney, 1938.

Certain aspects of the present Australian plant quarantine regulations are criticised, particularly the schedules of undesirable insects compiled by the Commonwealth and various State authorities, and a basis for the revision of these schedules, which should be brought up to date from time to time, is suggested. Examples are given of the unsatisfactory working of the present State regulations and the need for some central advisory body for the Commonwealth is stressed.

WALLACE (C. R.). **Unpoisoned Baits for reducing Populations of Banana Beetle Borer** (*Cosmopolites sordidus*).—*J. Aust. Inst. agric. Sci.* **4** no. 3 pp. 157–160. Sydney, 1938.

An account is given of some of the more important results obtained in field experiments with unpoisoned baits for the control of *Cosmopolites sordidus*, Germ., on banana carried out in New South Wales in 1933–37. The baits were prepared from well-grown banana pseudostems, cut off at ground level and sliced into cylindrical sections, 2½–3 inches thick; the proportion of rhizome to leaf-sheath tissue did not seem to affect their attractiveness. The baits were used at the rate of one per stool and covered with dead banana leaves. The weevils, which are very sluggish and feign death when disturbed, were collected from the surface of the bait or the soil below it. Tables show the catches for baits exposed in different situations, for different periods, and at different times of the year. They were more effective when placed in the stool, flat on the ground, than when laid between the stools. Many more weevils were taken when they were left in position for

6–8 days than for 1 day only. They should not be exposed for more than 8 days if hand collection is to be carried out, as the weevils start mining in the tissue after the first week, and penetrate deeply along the lacunae. Forty baits that had been dusted with Paris green and flour each contained an average of about 4 live beetles, and as many as 14 in some cases, embedded within them, after an exposure of 2 weeks. This suggests that baits might be left in position for 2–3 weeks and then removed from the plantation, after collection of any weevils at the surface; this method would be of special use in protecting new plantings from weevils migrating from adjacent infested areas. The baits attracted numbers of weevils during September–April, inclusive, but were almost completely avoided in mid-winter.

The percentage of the weevils attracted to the baits must vary with conditions of weather and environment, but an experiment to obtain an indication of it was carried out about the end of February in 1936, when 16 stools virtually free from *C. sordidus* were each artificially infested with 40 adults in their natural sex ratio. By means of baits applied 2½–3 weeks later and exposed for 7 days, 109 weevils were recovered. This is about 17 per cent. of the original number of 640 weevils, which had probably diminished little, as the weevils are long-lived and there was no evidence of the presence of specific predators in the district.

BELL (A. F.). **Report of the Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas Qd* **38** pp. 41–50. Brisbane, 1938.

In the year ending June 1938, the degree of infestation of sugar-cane by *Lepidoderma albohirtum*, Waterh., varied considerably in the cane-growing districts in northern Queensland [*R.A.E.*, A **26** 151]. The monsoon rainfall was lighter than usual in this area. In one locality, larvae were extremely scarce on their food-plants in the immediate vicinity of previously infested fields, but were fairly abundant on forest trees 1–1½ miles away; they apparently migrated back to the fields later, giving rise to a heavy infestation. This emphasises the impracticability of collecting the beetles by hand [**27** 88] and lends little promise to the practice of encircling areas with preferred food-plants. *Bufo marinus*, which was introduced into the state primarily for the control of this species [**24** 274], was observed breeding and feeding on the beetles under natural conditions. This toad is now present in all the sugar-growing areas in which Lamellicorn larvae cause noticeable injury.

In the Mackay district, *Lacon variabilis*, Cand., was abundant, as had been forecast in the previous year [**26** 151], but is expected to be comparatively scarce and confined to very low-lying areas in the next planting season. The cane-fields should be well drained during the summer, and trial sets should be undertaken to determine the infestation before planting is started.

In experiments on the control of borers [*Rhabdocnemis obscura*, Boisd.], thorough trashing did not appear to increase the hardness of the rind [*cf.* **25** 741] or bring about any change in the available sugar in the cane. However, by depriving the borers of their favoured sheltered positions, it reduced their numbers and, when carried out three times in severely infested cane, was apparently the cause of the slight increase in the weight of the cane over that of untrashed cane. It seemed that the injury might be satisfactorily reduced by trashing

in fields that are heavily infested largely owing to cultural conditions ; it would not be economic where only an average infestation occurred. Q2, an erect, free-trashing variety with a hard rind, was the most resistant, followed by Q10, whilst Q4 and Q12 were also less susceptible than Badila. A study has been made of the structure of the stalk of different varieties in order to determine factors which influence rind hardness, and it is thought that the thickness of the layer containing lignified bundles may be important. In the laboratory, 82·4 per cent. of the eggs were deposited in the leaf scar ; many more were laid in soft varieties than in hard and, although there was little mortality among the larvae, their development was much slower in hard varieties.

Cane that had been damaged by hail in April was severely infested by *Cirphis loreyi*, Dup., during May–June. This Noctuid is normally brought under control by parasites by early autumn, but in this case they were comparatively scarce. *Sturmia inconspicuoides*, Baranov, and *Compsilura concinnata sumatrensis*, Tns., were reared from larvae collected in the field [*cf.* **25** 315]. Larvae of *Lepidiota frenchi*, Blkb., caused severe injury in some fields.

In studies on chlorotic streak, it was found that plants with this disease may be heavily infested by *Aphis sacchari*, Zehnt. ; this is followed by a dense growth of sooty mould. In pot experiments, carried out in water-logged soil, *A. sacchari* and *Neomaskellia bergi*, Sign., again failed to transmit dwarf disease [**22** 169].

WARD (K. M.) & ROSS (A. A.). **Codling Moth Control Experiments, 1937–38.**—*Qd agric. J.* **50** pt. 3 pp. 286–294, 1 fldg graph, 2 refs. Brisbane, 1938.

The main results given in this description of experiments in Queensland in 1937–38 on the control of the codling moth [*Cydia pomonella*, L.] on apple have already been noticed from a briefer account [*R.A.E.*, A **27** 89]. The calyx spray, which preceded the white oil cover sprays contained 2½ lb. lead arsenate in 50 gals. water ; in this paper, however, the concentration is given as 2½ lb. in 80 gals. Schedules in which sprays other than lead arsenate were applied to the calyx resulted in a marked increase in calyx penetration by the larvae. Calyx and cover sprays consisting of 2½ lb. colloidal sulphur and 1 pint nicotine sulphate in 80 gals. water were considerably less effective than those consisting of white oil and nicotine sulphate [*cf.* **26** 149].

WEDDELL (J. A.). **The Brown Vegetable Weevil.**—*Qd agric. J.* **50** pt. 3 pp. 369–370. Brisbane, 1938.

The brown vegetable weevil [*Listroderes obliquus*, Klug] attacks various vegetables, tobacco seedlings, etc., in Queensland, mainly in July–September. The adults and larvae feed on the plant tissue, while the pupal stage occurs in the soil. The adults feed mainly by night and shelter in the soil during the day, but the larvae usually remain in sheltered positions on the leaves. This weevil may be controlled on crops such as potatoes by the application of lead arsenate sprays or dusts. Alternatively, poison baits consisting of the cut tops of plants such as tomatos, which are past the productive stage, or cape weed [*Cryptostemma calendulaceum*] dipped in lead arsenate solution or dusted with the powder may be partly buried,

in the late afternoon, between the rows of the crop. In infested fields, wild food-plants should be sprayed or dusted with lead arsenate a week or so before being cleared away, otherwise cutting may merely drive more larvae and adults on to the crop. Thorough ploughing before planting and after harvest should destroy many of the pupae.

Sloan (W. J. S.). **Mite Injury of Tomatoes.**—*Qd agric. J.* **50** pt. 3 pp. 370–371. Brisbane, 1938.

The tomato mite [*Phyllocoptes lycopersici*, Massee] is a pest of tomatos in central Queensland, particularly in the warm coastal areas. The type of injury is described [*R.A.E.*, A **24** 211]. The mite breeds rapidly, especially if a wet period is followed by warm weather. As a mite, similar in appearance, occurs on some weeds commonly found in the tomato-growing areas, clean cultivation is desirable to prevent it spreading to tomato.

Control measures include the application of proprietary dusting sulphurs, flowers of sulphur or ground sulphur at the rate of 4–14 lb. per acre, depending on the age and size of the plants. The addition of an equal quantity of fine hydrated lime or kaolin to the flowers of sulphur or ground sulphur facilitates application. Lime-sulphur (1 : 80, or 1 : 120 in warm weather), gives satisfactory control, as do several proprietary wettable sulphurs. A thorough spraying with lime-sulphur checks infestation more quickly than dusting with sulphur, but the latter treatment has a more lasting effect. The plants should be treated from the seedling stage onwards, at intervals varying from 2 weeks in summer to 6 in winter.

Buzacott (J. H.). **The Cane Beetle Borer.**—*Qd agric. J.* **50** pt. 3 pp. 381–382. Brisbane, 1938.

Most of the information in this account of experiments on the control of the cane beetle borer [*Rhabdocnemis obscura*, Boisd.] has been noticed from another source [*R.A.E.*, A **27** 185]. In each trial some cane was left untrashed, while some was trashed twice and some three times, at two-monthly intervals. The first trashing was made when stools showed about a foot of cane. In one of the heavily infested plots, the above treatments resulted in 132,000, 27,000 and 12,000 borers per acre, respectively. An increase in weight of trashed cane over untrashed cane was registered in two out of six plots, the other four showing no significant difference.

Pescott (R. T. M.). **The Carpet Beetle** (*Anthrenus varius* **Lea**).—*J. Dep. Agric. Vict.* **36** pt. 10 pp. 479, 480, 483, 4 figs. Melbourne, 1938.

A popular account is given of the life-history in Victoria of *Anthrenus verbasci*, L. (*varius*, F.), the larva and adult of which are briefly described. The larvae attack all furnishing and clothing materials of animal origin, particularly the pile of carpets. They can survive for a time on starches, but do not attack woodwork. The adults fly from house to house, are attracted to light, and are found at windows and on white flowers out of doors. The female lays up to 100 eggs in floor cracks or the pile of carpets, and these hatch in 7–18 days. The larval stage, which lasts about three months, comprises 6 or 8 instars. There are two generations a year in Victoria.

The best methods of control are thorough cleaning and the use of commercial pyrethrum sprays, which should be applied repeatedly under pressure to furniture and to any places where the larvae may be hidden, and allowed to soak into the infested portions of carpets. In the case of severe infestation, fumigation with hydrocyanic acid gas may be necessary.

In spaces used for the storage of textiles, 1 lb. naphthalene or paradichlorobenzene per 100 cu. ft. should be scattered on paper at different levels. Carpets should be cleaned and sprinkled with one of these repellents, rolled tightly and sealed in several thicknesses of brown paper, before storing.

MENDES (L. O. T.). **Aspectos do problema da "Broca do Café" *Stephanoderes hampei* (Ferr.).** [Aspects of the Problem of the Coffee Berry Borer.]—*J. Agron.* **1** no. 4 pp. 339–358, 10 refs. S. Paulo, October 1938. (With a Summary in English.)

Since the first observation of the infestation of coffee in São Paulo, Brazil, by *Stephanoderes hampei*, Ferr. [*R.A.E.*, A **15** 523], the borer has spread throughout the coffee growing regions of the State, and its eradication is considered impracticable. The author briefly reviews the work that has been carried out on the biological control of the pest, particularly the introduction from Uganda against it of the Bethylid, *Prorops nasuta*, Wtstn. [*cf.* **22** 186], but considers that investigations should be given a fresh trend by intensive study of the ecological factors involved. Very little work on the relations of the borer, the parasite, coffee and physical environment has been carried out, and a thorough study on these lines will necessitate the co-operation of specialists other than entomologists. Investigations in Brazil should be supplemented by others in other regions, particularly Uganda.

BUSCK (A.). **A new woodboring Lepidopteron, injurious to Fruit Trees in Argentina.**—*An. Soc. cient. argent.* **126** p. 4 pp. 280–284, 2 figs. Buenos Aires, 1938.

Timocratica haywardi, sp. n., is described from the province of Entre Rios, Argentina, where the larva of this Tineid bores into the living trunks and branches of *Psidium*, *Eugenia edulis*, and several cultivated fruit trees, including apple, plum and peach, which it is said to injure severely.

HALLER (M. H.), CASSIL (C. C.), MURRAY (C. W.), BEAUMONT (J. H.) & GOULD (E.). **Removal of Lead Spray Residues from Apples grown in the Shenandoah-Cumberland Valley.**—*Tech. Bull. U.S. Dep. Agric.* no. 622, 31 pp., 1 fig., 21 refs. Washington, D.C., 1938.

Investigations to determine the principles involved in the removal of lead residues from apples grown in the eastern United States were made in Maryland and West Virginia in 1934 and 1935 and are reported in great detail.

The following is based on the authors' summary and conclusions: Five varieties were treated with lead arsenate and Bordeaux mixture with mineral-oil emulsion and various spreaders added to certain of

the cover sprays, and washed with hydrochloric acid or sodium silicate solutions. The variety did not appear to influence greatly the amount of residue at harvest or the ease of removal, nor did the addition of fish oil or mineral-oil emulsion to the first two cover sprays, or the addition of fish oil casein-lime or colloidal spreaders to the late cover sprays influence ease of removal when acid washing solutions were used. The addition of mineral-oil emulsion to the second-brood cover sprays greatly increased the lead residues at harvest and the difficulty of cleaning. However, residues were reduced as much on apples that had been sprayed with oil as on those that had not, when the more effective washing treatments were used. The application of seven cover sprays instead of five, the last two later in the season, considerably increased the amount of residue at harvest and the difficulty of its removal, as also did the omission of lime from the late cover sprays when acid solutions were used. There was no significant difference in the amount of residue at harvest or the ease of removal when the quantity of lime in the cover sprays was increased from 4 to 8 lb. per 100 U.S. gals. The residues remaining after relatively ineffective washing treatments were very closely correlated with the residues at harvest. With the most effective treatments, there was a tendency for the residues to be removed to approximately the same minimum for all lots of fruit, regardless of the original load or the type of spray applied. The residues on the more easily cleaned lots were reduced to these low levels by the less effective treatments. When such levels were reached, increasing the effectiveness of the washing treatment resulted in little or no extra removal. The average residues remaining after apples had been exposed in a flotation washer for 1 minute to a 0·5 per cent. solution of hydrochloric acid at room temperature were 31·5 per cent. in 1934 and 46 per cent. in 1935. A greater percentage of the heavier residues left by seven cover sprays was removed than of that left by five cover sprays. When the acid concentration was increased to 1·5 per cent., the lead residues remaining averaged 19 per cent. of the residues before washing in 1934, and 31 per cent. in 1935. Increasing the time of exposure to acid solutions in a flotation machine from half a minute to one minute resulted in the additional removal of 9 per cent. of the residue after the shorter exposure in 1934 and 17 per cent. in 1935. Further increases in time of exposure resulted in little or no further benefit. Heating a 1·5 per cent. hydrochloric acid solution to 100°F. resulted in an average reduction of the residues to 16 per cent. of that on the unwashed samples in 1934, and 25 per cent. in 1935. This treatment reduced the residue on practically all lots to within the tolerance in 1934, but it was not sufficiently effective for any of the lots in 1935. Slight but significant increases in removal were obtained by 10° increases in temperature between 90° and 110°. Washing at 33° was considerably less effective than at 60–70°. Greater benefit was obtained when solutions containing wetting-agents were heated than when solutions of acid alone were heated. No benefit was obtained from the addition of 1·0 per cent. sodium chloride to 1·5 per cent. hydrochloric acid solution. When apples were washed at room temperature in a 1·5 per cent. hydrochloric acid solution to which 1·0 per cent. of a wetting agent was added, the lead residues remaining were 14·5 per cent. of the original in 1934 and 18·2 per cent. in 1935 when the lots that had received no treatment including lime were omitted, and at 100°F. the percentages were 11 and 13·4. The wetting

agent was more effective with apples sprayed with lead arsenate and mineral-oil emulsion than with apples sprayed with lead arsenate alone. The addition of the wetting agent at room temperature was slightly more effective than heating the acid solution to 100° for apples sprayed with lead arsenate and mineral oil and about equally effective with other lots. The addition of 1 gal. of a light mineral oil to 100 gals. of heated acid solution in a flood-brush machine greatly increased the effectiveness of the washing solution for apples sprayed with lead arsenate and mineral oil emulsion, but not for apples that did not have oil emulsion in the cover sprays. Heated solutions of sodium silicate were less effective than heated acid solutions, except when lime was omitted from the late sprays. A double wash with acid and sodium silicate solutions was not significantly more effective than a double wash with acid solutions. Storage at 32°F. for 4–5 months considerably increased the difficulty of removing the lead residues, particularly when a solution of acid alone was used. When a wetting agent was used, the residues were only slightly higher when the apples were washed after storage than when they were washed soon after harvest. Washing the apples did not increase the amount of decay during storage at 32°F., whether they were packed and stored while wet or after drying. One variety showed slight lenticel injury when washed with heated solutions of acid and wetting agent. It developed slight heat injury when washed at 110°F. for 1·5 minutes and considerable injury when washed at 120° for 1 or 1·5 minutes.

MARTIN (C. H.). **Effect of Sun-light and of Location of Logs on the Beetle Infestations of Elm Logs.**—*Bull. Brooklyn ent. Soc.* **33** no. 4 pp. 195–203, 2 pls., 2 refs. Brooklyn, N.Y., 1938.

Further experiments with trap-logs for the elm bark-beetles, *Scolytus multistriatus*, Marsh., and *Hylastes* (*Hylurgopinus*) *rufipes*, Eichh., carried out in New York State during 1936 and 1937, confirmed the influence of sunlight on infestations by *Scolytus* [*cf. R.A.E.*, A **24** 524], and indicated that infestations by *Hylastes* were unaffected by light or shade. No attempt was made to distinguish between the effects of heat and of light.

Infestation by *Scolytus* was increased by arranging the logs, 2½ ft. long and of average diameter 5–6 ins., as ladder racks, in most cases by nailing 2 vertical 10 ft. poles to the ends of 4 logs set 1½ ft. apart, or by hanging them horizontally, 1 ft. apart, 35–40 ft. above the ground by means of ropes. Both arrangements of logs received more sunlight than the controls, which consisted of logs arranged in horizontal racks.

In logs cut between 15th September 1936 and 15th May 1937 in the ladder racks, and in suspended logs cut between 10th April and 14th June 1937, where the infestation by *Hylastes* was high, that by *Scolytus* in 1937 was not significantly different from that in the corresponding controls, but where the infestation by *Hylastes* was low (in logs cut during 30th May–17th August and 17th July–17th August 1937, respectively), it was practically twice as great. The clearing of trees round a rack in deep shade, to increase the amount of sunlight falling on it, caused a marked increase in infestation by *Scolytus*.

In neither ladder racks nor suspended logs were the infestations of *H. rufipes* significantly different from those in the controls. One ladder rack was much more heavily infested than others nearby,

probably because it was near a large hibernating population. As there was no significant difference between infestations, by either species, of ladder racks and suspended logs, it appears that logs near the ground are as readily attacked as those high above it. The largest numbers of *H. rufipes* came to logs cut in autumn, winter, or in spring before the late May peak population, whereas the largest numbers of *S. multistriatus* came to those cut in July or August of the season in which infestation occurred.

Grape Berry Moth (*Polychrosis botrana*, **Schiff.**).—*Palestine Gaz.* Oct. 1938, *Agric. Suppl.* no. 34 pp. 196–199. Jerusalem, October 1938.

The preliminary results are given of investigations in progress since 1936 on the bionomics and control of *Polychrosis botrana*, Schiff., in Palestine, where it injures 25–40 per cent. of the grape crop.

The adults from hibernating pupae usually appear about 18th–20th May in coastal and hilly areas and 10 days earlier in the inner plains, males appearing 4–5 days before females. Oviposition takes place immediately after pairing, a female depositing about 100 eggs. The larvae of the first, second and third generations appear at the beginning, and the adults at the end of June, July and August, respectively. The egg, larval, prepupal and pupal stages last 2–3, 18, 2 and 7–8 days. All generations of larvae attack the fruit, the third being the most destructive. There is a small fourth generation, the larvae of which attack grapes in the hills at the beginning of September. This generation hibernates in the pupal stage in cracks of bark or in the upper layer of soil.

The wounds made by the larvae in their search for suitable fruits for boring attract secondary insects and are attacked by pathogenic fungi. Of the larvae of various species present on the bunches, 50–80 per cent. are those of *Cryptoblabes gnidiella*, Mill., which feed on the juice and flesh of damaged berries, but may also develop on healthy bunches. The generations of this Tineid overlap to such an extent that all stages may be found on the bunches at the same time. The larvae and adults of both species are briefly described.

The varieties of grapes that are least subject to attack are those with loose bunches, thick skins or little foliage. For control, a dust containing 15–20 per cent. finely ground calcium arsenate and talc may be used against first-generation larvae, but should not be used later owing to the danger of arsenical residue on the fruit. Against later generations, effective control was given by monthly applications, at the beginning of June, July and August, and up to 10 days before marketing, with a dust of sodium fluosilicate (98–99 per cent. pure) and talc or sulphur, at the rate of about $6\frac{1}{4}$–$7\frac{1}{2}$ lb. per 250 vines. This must be washed off grapes for wine before they are crushed. If the humidity is high, 1 or 2 per cent. of the foliage may be scorched at the first application. Owing to the climate, derris and pyrethrum were unsuccessful in the field.

Frézal (J.). **Recherches et essais effectués en 1936 sur** *Laspeyresia pomonella* **L., dans le département d'Oran.**—*Rev. Zool. agric.* **37** nos. 1, 2, 4 pp. 1–15, 28–32, 56–64, 6 graphs. Bordeaux, 1938.

Although damage by *Cydia* (*Laspeyresia*) *pomonella*, L., makes it difficult to obtain sound fruit in Algeria after 15th July, large

orchards of late apples and pears have recently been planted. With a view to avoiding serious losses in the future, investigations were carried out in Oran in 1936 on the life-cycle of the pest, the efficacy of arsenical sprays during and after the period of five weeks after flowering, within which they may legally be applied, and the problem of arsenic residues on the fruit.

Observations showed that there are three generations a year, of which the larvae of the third and some of those of the others hibernate. The first two cause serious damage, and the third may become important under abnormal weather conditions. Some of the larvae hibernate in shelters on the bark of trunks and branches, but most of them probably do so in the ground. Of the former, the majority preferred the south side of the tree. Emergence of the adults had begun by 3rd April on the south, and by 10th April on the north of apples and pears flowering in April and fruiting in August and September, and was completed by 21st and 31st May, respectively. On early pears, development was more rapid; only larvae were present on 21st February; on 10th April some, and on 1st May all the adults had emerged. Comparison between cocoons on quinces and on late apples and pears suggested that the rate of development might depend to some extent on the different fruiting seasons of the trees. On 14th April all cocoons from quince trees contained larvae, while of cocoons from late apples and pears, 28·5 per cent. contained pupae and 8·9 per cent. were empty. On 28th April, adults had emerged from 12·5 per cent. of the cocoons from quince and about 27–28 per cent. of those from apples and pears. From 62 cocoons collected on 22nd February, all but 4 adults emerged in the laboratory between 28th March and 27th May, the maximum emergence occurring during April. Males emerged a little earlier than females.

From 20th March, bait traps were used to find when the trees were likely to be attacked. Moths were captured from 6th April to 4th June and from 26th June to 1st September. The former were those of the hibernating generation, and the latter apparently of the first generation, since full-grown larvae in pears collected on 28th May gave rise to adults that emerged on 22nd, 24th and 29th June. No moths were caught when the evening temperature was below 15°C. [59°F.], and most of them were taken at low relative humidities. A single adult, presumably of the second generation, was caught on 8th October. All larvae collected after 20th August remained in diapause throughout the winter, and although most of the apples and quinces examined in October had been damaged, no larvae were found in them.

Sprays of 9 lb. lead arsenate (19 per cent. As_2O_5) in 100 gals. water or Bordeaux mixture, with or without the addition of 1 gal. kerosene emulsion, were applied to five plots of apples and pears. Applications were made within the legal period, on 28th April and 15th and 24th May for pears, and 9th and 23rd June and 8th July for apples, and subsequently at fortnightly intervals. On pears, the percentage control was 94 for 7 and 93·5 for 4 treatments without emulsion, and 85 for 7 and 74·6 for 4 with it. On apples it was 97·5 for 7 and 87·7 for 4 treatments without emulsion, and 92·6 for 7 and 74·1 for 4 treatments with it. Control was only 45·3 and 34·1 per cent. on pears and apples, respectively, when the lead arsenate spray alone was applied 3 times within the legal period. In 1937, apple trees sprayed 4 times from 29th April to 20th July gave more than 95 per cent. sound fruit.

Analysis of arsenical residues at harvest time showed that the load depended on the number of applications and was very little affected by rain, but that, owing to the rapid growth of the fruit, it was considerably reduced when the interval between the last application and picking was increased.

When samples of apples bearing considerable residues were placed for a few minutes in a 1 per cent. solution of hydrochloric acid, those that had received lead arsenate without the kerosene emulsion lost almost all their arsenic, whereas the others retained more than the tolerated dose of 0·01 gr. As_2O_3 per lb. fruit (about 0·001 mg. arsenic per kg.).

It is concluded that the trees should be sprayed from the beginning of April until 15th August. Spraying should begin when the adults emerge and should finish for each variety of fruit about 2 months before the usual time of gathering.

Feytaud (J.), Schwartz (M.) & Trouvelot (B.). **Un exemple de collaboration internationale pour l'étude en commun de la lutte contre le doryphore : la recherche de solanées résistantes.**—*Rev. Zool. agric.* **37** no. 5 pp. 65–68, 1 ref. Bordeaux, 1938.

The international cooperation [*cf. R.A.E.*, A **27** 107, etc.] that has existed since 1936 in investigations into the possibility of developing a strain of potatoes resistant to the Colorado potato beetle [*Leptinotarsa decemlineata*, Say] is discussed, and the importance of such collaboration is stressed.

Brémond (P.) & Rungs (C.). **Observations sur la pyrale dorée, ravageur de la menthe cultivée au Maroc** (*Pyrausta aurata meridionalis* **Stgr.**).—*Rev. Path. vég.* **25** fasc. 3 pp. 190–194, 2 figs., 7 refs. Paris, 1938.

Larvae of *Pyrausta aurata meridionalis*, Stgr., caused considerable damage to cultivated mint (*Mentha viridis*) in Morocco in 1936, particularly in the north-west, where the plants were entirely defoliated in August and September. Investigations on the bionomics and control of this Pyralid, which also attacks wild mint (*M. rotundifolia*), are described.

Near Rabat, there were four complete and one partial generation in the year, of which adults emerged at about the beginning of May, the beginning of July, the end of August, the end of September and mid-December, but most of the pupae of the last generation hibernated.

In the laboratory at 25°C. [77°F.] and 70 per cent. relative humidity, females oviposited on the lower surface of young leaves on 1st and 2nd September. The larvae hatched two days later and attacked the young shoots and leaves. They spun shelters in the leaves, joining or folding them, or occasionally along stalks, leaving them in order to feed, and then spinning new ones some distance away. They moulted five times and pupated in cocoons on 17th–18th September. The adults emerged from 25th September to 6th October, and lived 8–11 days. Of the larvae and pupae collected, 28·5 per cent. were parasitised by the Braconids, *Meteorus pulchricornis*, Wesm., *Hormius* sp., which was itself attacked by *Eupteromalus nidulans*, Först. [*R.A.E.*, A **18** 151], *Chelonus* spp., and *Apanteles* sp., *Elasmus*

sp., and the Tachinid, *Nemorilla floralis*, Fall., females of which deposit one egg on the thorax of the host larva. The adult emerges from the pupa of the host. Hymenopterous predators observed included various wasps.

Attempts to control the infestation by means of sugared baits were unsuccessful, although the moths were very numerous. Experiments with a 2 per cent. solution of a proprietary contact insecticide containing 3 per cent. rotenone and 67 per cent. soap powder indicated that it should be sprayed four days after the appearance of the moths, and that control is improved by a second spray eight days after their disappearance. Equally successful results were obtained with a proprietary rotenone dust.

COUTURIER (A.). **Remarques sur la tendance au parasitisme de *Meigenia mutabilis* Fall. sur le doryphore (*Leptinotarsa decemlineata* Say).**—*Rev. Path. vég.* **25** fasc. 3 pp. 195–210, 30 refs. Paris, 1938.

In 1935–1936, the author observed larvae of *Leptinotarsa decemlineata*, Say, on potato in south-western France bearing eggs of *Meigenia mutabilis*, Fall., and also a female of this Tachinid attempting to oviposit on a larva. Laboratory investigations showed that some of the larvae died, although the parasite did not complete its development [*cf. R.A.E.*, A **25** 648]. Either the egg was moulted with the larval skin before it hatched, or if it hatched, the larva died because it could not penetrate the skin of the host, or because the immediate reaction of the host to attack was too violent, or, if it succeeded in entering the host, from asphyxiation at the end of the first instar because it could not pierce the body wall to make a breathing hole. Dead larvae were observed in the body cavity of the host, or if they had died while entering, the head was encysted in the host and the rest of the body was still in the shell of the egg. It is considered possible that the body fluid of *L. decemlineata* possesses properties that render it almost immune from parasitism. Beetles that reached maturity after attack appeared perfectly normal.

When small numbers of larvae of various instars were parasitised in the laboratory, only a small proportion of hosts that were parasitised in the second instar gave rise to adults. When parasitised during the third instar more, and in the fourth instar almost all of them, became adult. In nature, eggs are found on second-, third- and fourth-instar larvae, but the later instars are attacked more readily, and are also exposed for a longer period. When equal numbers of third- and fourth-instar larvae were subjected to attack in the laboratory, the latter proved twice as attractive as the former. Calculation showed that 8 times as many eggs are laid, and 12 times as many larvae may penetrate the host, on fourth- as on third-instar larvae, and that $\frac{3}{4}$ and $\frac{1}{2}$, respectively, of the eggs laid during these two instars may hatch successfully.

M. mutabilis has been recorded in the literature as parasitising several Chrysomelids (*sens. lat.*), together with a few Lepidoptera and sawflies, and an Acridid. In the case of *Crioceris asparagi*, L., the larva enters the host from the egg and moves freely in the body cavity until just before the first moult, when it fastens itself to the body wall and makes a hole through which to breathe. After the second moult it retreats more deeply into the host, which soon dies.

Pupation takes place in the host 8 days after the egg is laid, and the pupal period is 12 days. More than half the parasites that succeed in attacking *C. asparagi* die before maturity because the host itself dies. In the author's experiments, almost all larvae that were attacked were in the last instar, and none became adult. Only a quarter were able to make their cocoons, inside which the parasites pupated. The other larvae died too soon for the parasites to mature.

Poutiers (R.). **Notes biologiques sur la mouche des fruits** (*Ceratitis capitata* **Wied.**).—*Rev. Path. vég.* **25** fasc. 3 pp. 211–217, 1 ref. Paris, 1938.

The development of autumn generations of *Ceratitis capitata*, Wied., on the Mediterranean coast of France is encouraged by the presence of figs, persimmon [*Diospyros kaki*] and acclimatised exotic plants such as *Bumelia lycioides*, which are particularly attacked late in the season.

From 300 berries of *Bumelia lycioides* from a tree at Antibes, 198 larvae emerged between 21st and 25th October; they pupated 20–68 hours later. Some berries contained up to 3 fully developed larvae and 7–8 that were unable to develop. Adults emerged about a month later, but many would probably find little fruit available and would die without reproducing. Larvae from peaches, which pupated on 8th–10th and 15th–18th October, gave rise to adults on 25th–28th October and 6th–15th November, respectively, while larvae from *Crataegus azarolus* and persimmon gave rise to adults between 27th November and 5th December, after pupal periods of 31–39 days. Of the adults that resulted from larvae from the various fruits examined, the females emerged first and were the more numerous.

The proportions of pupae from which adults emerge vary in different environments. Pupae placed in tubes for observation gave 64 per cent. normal and 4 per cent. abnormal adults. The remainder did not mature. Although it has been stated that the adults can emerge from deeply buried pupae, it was found that they had difficulty in penetrating more than 3–4 cm. of soil, particularly if it was wet. When 5 pupae were buried under 5 cm. dry soil, 3 adults emerged, but 1 could not reach the surface. In wet soil at the same depth, 3 emerged but all died underground. From 10 pupae buried 10 cm. deep in dry soil, 5 adults emerged, but only 1 reached the surface, and in wet soil 4 emerged, but none reached the surface. When 23 pupae were buried 0·5 cm. deep 13 adults emerged, and all reached the surface. This proportion corresponds to that in the tubes and is probably normal in nature under favourable conditions.

When larvae about to pupate were placed singly on 15th October on dry and sandy soil in tubes, or on soils wet to depths of 1 and 3 cm., they buried themselves almost at once, and in all cases but the last the adults emerged on the 19th November. The wet soils were allowed to dry after the larvae had entered them, and in the last case, when the larva buried itself 2 cm. deep, the adult emerged from the pupa but could not pierce the crust of earth formed above it. When a larva was placed on the surface of closely packed dry soil, it could not bury itself and the pupa shrivelled. Emergence took place on the 20th November when larvae were covered with 2 cm. of either dry or damp earth, but the adult from the dry earth had imperfect wings, and died almost at once. From 3 cm. of damp earth, the adult emerged on 20th November, and from the same depth of dry earth the

adult emerged, but was malformed and died below the surface. It is concluded, therefore, that pupation normally takes place at depths of 2–3 cm., and that emergence, either below or above ground, is hindered by the drying up of damp soil.

Bleton (C.). **Observations sur quelques lépidoptères parasites des peupliers dans la région de Fès (Maroc).**—*Rev. Path. vég.* **25** fasc. 3 pp. 218–225. Paris, 1938.

In view of the possible economic importance in Morocco of black poplar (*Populus nigra*), brief notes are given on the bionomics near Fez of a number of Lepidoptera of which the larvae attack the leaves. These are much more numerous, but usually less injurious, than those that attack the wood, but for the last few years some larvae, particularly those of *Dicranura vinula* var. *delavoiei*, Gaschet, have entirely defoliated the trees. In Middle Atlas the damage was so severe that the larvae had to be shaken from the trees, collected and destroyed.

D. vinula hibernates in a hard dome-shaped cocoon on the tree-trunk or in the soil. Adults emerge from mid-February until April, and oviposit on the leaves. The larvae appear in April and May, feed on the parenchyma of the leaves, and pupate in May and June. The adults usually emerge in the next spring, but there is sometimes a partial second generation, of which the larvae pupate in October. The pupae are often parasitised by the Ichneumonid, *Cryptus sponsor*, F., and by an unidentified Hymenopterous parasite.

Other Lepidoptera infesting poplars and willows are *Smerinthus populi* var. *austauti*, Stgr., *Smerinthus ocellatus* var. *atlanticus*, Aust., which is less common, the Notodontids, *Cerura bifida*, Hb., and *Pygaera pigra*, Hfn., *Amphipyra tragopoginis*, L., *Scoliopteryx libatrix*, L., *Catocala oberthüri*, Aust., *Enarmonia* (*Gypsonoma*) *minutana*, Hb. and *Tortrix pronubana*, Hb.

Lepesme (P.). **Sur le régime et l'importance économique de quelques *Trogoderma* (Coleoptera Dermestidae).**—*Rev. franç. Ent.* **5** fasc. 2 pp. 104–106. Paris, 1938.

Most species of *Trogoderma* live under the bark of trees or in disused larval galleries, feeding on débris of animal origin. Some, however, such as *T. tarsale*, Melsh., *T. sternale*, Jayne, and *T. ornatum*, Say, infest collections of insects, and animal products such as fur, wool and feathers, and a few have adapted themselves to vegetable products. *T. versicolor*, Creutz., feeds on various sorts of dead or living animal matter [*cf. R.A.E.*, A **22** 196] and has been recorded infesting woollen material and occasionally attacking stored grain. *T. tarsale* occasionally causes serious damage to cocoons of the silk worm [*Bombyx mori*, L.] and is a most serious pest of natural history collections, furs, skins, woollens, botanical and pharmacological collections and seeds of various kinds, as well as being a minor pest of stored cereals and tobacco [**7** 367]. *T. granarium*, Everts (*khapra*, Arrow), is the most important pest of stored grain, particularly barley and wheat. It is doubtful whether it is ever carnivorous. Fourth-instar larvae infest sound grains, but younger ones can only attack those already damaged.

Dotti (F.). **Ulteriori ricerche sul valore insetticida dell'infuso di legno quassio.** [Further Investigations on the insecticidal Value of Infusion of Quassia.]—*Riv. Fruttic.* **2** no. 1 repr. 7 pp. Pistoia, January 1938.

In continuation of previous experiments in Italy with infusions of quassia [*R.A.E.*, A **27** 97], work in 1937 showed this insecticide to be effective against *Hoplocampa brevis*, Klug, attacking pear. A 2 per cent. infusion applied twice with an 8-day interval to pears in full blossom reduced infestation from 32·17 and 30·95 to 3·35 per cent. In some districts this sawfly has increased on apple following the discontinuance of arsenical sprays during blossoming time. In comparative tests against *Cydia pomonella*, L., infesting apple, an infusion of quassia proved distinctly inferior to lead arsenate.

Dotti (F.). **La cattura diretta delle larve di *Cydia pomonella*, L.** [Direct Capture of the Larvae of *C. pomonella*.]—*Riv. Fruttic.* **2** no. 2 repr. 19 pp., 16 refs. Pistoia, April 1938. (With Summaries in French, English and German.)

An account is given of experiments in 1935–37 with corrugated cardboard bands impregnated with beta-naphthol against *Cydia pomonella*, L., infesting apple in Italy. Bands 2 inches wide were satisfactory. About 54 larvae per tree were captured by treated bands in 1935, and this number was not increased when several bands were applied per tree. In the course of the summer, bands with beta-naphthol captured an average of 55 larvae, whereas the average number of larvae in untreated bands, which were examined four times during the season, was only 20. In the year in which the beta-naphthol bands were applied, the average number of infested fruit per banded plant was less than one-half the average in unbanded trees ; banding during successive years led to a progressive decrease in the number of larvae captured. Beta-naphthol bands gave no appreciable result against larvae of *Cydia molesta*, Busck, infesting peach [*cf. R.A.E.*, A **25** 732], but were very effective against *C. pomonella putaminana*, Stgr., on walnut.

Care should be taken to scrape the trunk and main branches of the trees. This is best done in March to prevent new refuges being available in summer and autumn when the larvae descend to hibernate. All the débris and prunings should be burned, and all cracks should be filled in with cement or tar. The bands should be applied to all apple and pear trees in bearing. They should touch the bark, and are best secured with broad-headed tacks, the ends of the bands touching closely but not overlapping. Impregnation of the bands is effected by dipping to a depth of 1 inch first one half and then the other of the roll of cardboard for 3–4 seconds in a mixture of 16 parts by weight of lubricating oil and 10 parts of beta-naphthol kept at a temperature between 130 and 134°C. [266 and 273·2°F.].

Grandori (R.) & Mariani (G.). **Una grave minaccia per il sorgo zuccherino : la *Sesamia cretica*.** [*S. cretica*, a serious Menace to Sugar Sorghum.]—*Boll. Zool. agrar. Bachic.* **8** pp. 123–128. Turin, 1938.

Seed of sugar sorghum [*Sorghum vulgare* var. *saccharatum*], obtained in the United States in 1936–37, has been distributed in 20 provinces

in Italy over an area of about 1,500 acres. The principal insects that attack this crop in Italy are *Sesamia cretica*, Led., which is most numerous in the south, and *Pyrausta nubilalis*, Hb., which predominates in the north.

A brief description is given of the manner in which *S. cretica*, which is also a pest of maize [*R.A.E.*, A **23** 520], infests and injures sugar sorghum. The eggs are laid on the leaves, and the larvae, sometimes after feeding on the leaves and ear, enter the stalk, preferably the lower half, which is so weakened that the plant is easily blown over. The attack also causes a reduction in the percentage of sugar and in the yield of seed. Morphological differences in the larvae seem to indicate that 2 or 3 species of *Sesamia* occur. *P. nubilalis* is much less harmful than *S. cretica*, as its larvae confine their attack to the nodes, and varieties of which the nodes are protected by the leaves are not infested. The enormous increase of these two moths in 1937 indicates lack of the usual control by endophagous parasites.

CANDURA (G. S.). **La Plodia in Italia. Contributi 1–2.** [*Plodia interpunctella* in Italy. Contributions 1–2.]—*Boll. Zool agrar. Bachic.* **8** pp. 129–155, 10 figs. Turin, 1938.

In the first part of this paper the author reviews the literature on *Plodia interpunctella*, Hb., with notes on its world distribution and the products it attacks, and in the second he describes in detail all stages of this Pyralid.

GIORGI (D.). **Nuovo metodo di lotta contro il** *Dermestes lardarius* **L.** [A new Method of controlling *D. lardarius*.]—*Boll. Zool. agrar. Bachic.* **8** pp. 157–176, 3 figs., 30 refs. Turin, 1938.

Notes on the biology of *Dermestes lardarius*, L., are given from a recent account [*R.A.E.*, A **26** 153], and the various measures employed against this pest of silkworm cocoons in Italy are reviewed [*loc. cit.*, etc.].

The main portion of the paper comprises an account of laboratory and factory tests with a non-explosive, non-inflammable liquid of unspecified composition which evaporates, thus forming a fumigant that gave total mortality of adults and larvae of the pest ; it also kills silkworm eggs. It is more effective against adults than against larvae of *Dermestes* and is best applied between mid-January and mid-April, before the adults have emerged from their winter quarters. The liquid is used at the rate of 1 oz. per 10 cu. ft., all windows, cracks and apertures being sealed with oiled paper, and the fumigant should be left to act for three or more days.

CANZANELLI (A.). **Un'infestione di** *Plodia interpunctella* **Hb. sul** *Dolichus melanophthalmus* **DC.** [Infestation of *D. melanophthalmus* by *P. interpunctella*.]—*Boll. Zool. agrar. Bachic.* **8** pp. 183-186, refs. Turin, 1938.

An account is given of an infestation observed in Italy of samples of seed of *Dolichos melanophthalmus* by the larvae of *Plodia interpunctella*, Hb. In the laboratory, the larvae left the beans early in February, wandered for a few days, and spun silken cocoons from 15th to 25th February ; all had pupated by the 28th. The adults

emerged about a fortnight later ; the males died after pairing, and the females began ovipositing, each laying about 50 eggs. The larvae hatched in about a week and entered the seeds, not more than one occurring in each.

Grandori (L.) & Modena (M. P.). **Allevamento sperimentale del *Lariophagus utibilis* Tucker.** [Experimental Breeding of *L. utibilis*.]—*Boll. Zool. agrar. Bachic.* **8** pp. 187-189, 5 refs. Turin, 1938.

A Pteromalid identified as *Lariophagus utibilis*, Tucker, by Masi, who considers this species distinct from the very closely related *L. distinguendus*, Först., was found parasitising *Calandra oryzae*, L., in a macaroni factory in Milan. In the laboratory, the females were seen to feed on the larvae by piercing them with the ovipositor and then introducing the mouth-parts into the wound, the victim becoming wax coloured and mummified. The larvae of *L. utibilis* devour the host larvae and pre-nymphs until only a few chitinous parts, especially of the head, are left. The technique used in breeding the parasite is described.

Parisi (E.) & Moretti (G. P.). **Un efficace metodo di lotta contro la Piralide (*Pyrausta nubilalis*) sul sorgo zuccherino.** [An effective Measure against *P. nubilalis* on Sugar Sorghum.]—*Boll. Zool. agrar. Bachic.* **8** pp. 211–216, 3 figs. Turin, 1938.

Weak solutions of pyrethrum-soap and of pyrethrum only in water were shown to be effective against larvae of *Pyrausta nubilalis*, Hb., infesting sugar sorghum [*Sorghum vulgare* var. *saccharatum*] in preliminary tests carried out near Milan. A hand pressure-sprayer was used, and the jet was directed from above between the leaves in the growing centre of the plant. The liquid ran down the leaves to the base and killed the larvae there. Dusting with barium fluosilicate gave less satisfactory results.

Canzanelli (A.). **La lotta contro il Tonchio del fagiolo (*Acanthoscelides obtectus* Say) con un nuovo insetticida.** [Work against *Bruchus obtectus*, Say, by Means of a new Insecticide.]—*Boll. Zool. agrar. Bachic.* **8** pp. 217-222, 21 refs. Turin, 1938.

Experiments against *Bruchus* (*Acanthoscelides*) *obtectus*, Say, with a non-poisonous and non-inflammable liquid of unspecified composition that gives rise to a fumigant vapour heavier than air showed that when sprayed in a store room at the rate of 3 oz. per 10 cu. ft. it killed all stages of *B. obtectus* in beans in bags and did not affect the germinating powers of the beans. The room should be sealed up and left for 3 days.

Cosolo (S.). **La *Cydia molesta* del pesco nell' Agro Monfalconese.** [The Peach Moth, *C. molesta*, in the Monfalcone Zone.]—*Boll. Zool. agrar. Bachic.* **8** pp. 223–232. Turin, 1938.

This report by a peach grower in the Monfalcone district, north-eastern Italy, indicates that regular, frequent, and careful collections of infested shoots enable the peach crop to be almost entirely protected from attack by *Cydia molesta*, Busck. The cost of the work is shown

to have been very low. Considerable importance is also attached to the destruction of the adults resulting from larvae hibernating in the empty fruit boxes [*R.A.E.*, A **26** 714] by storing them in a room in which the temperature was gradually raised from 15° to 25°C. [59° to 77°F.], so that the adults emerged before the boxes were needed.

GRANDORI (R.). **L'azione disinfestante della calciocianamide contro la mosca domestica sperimentalmente dimostrata.** [The disinfesting Action of Calcium Cyanamide against the House-fly shown experimentally.]—*Boll. Zool. agrar. Bachic.* **8** pp. 233–250, 5 diagr. Turin, 1938.

In the main part of this paper are described experiments in Italy with calcium cyanamide against the house-fly [*Musca domestica*, L.] infesting manure [*R.A.E.*, B **27** 84].

As a basis for this work, the author investigated the action of calcium cyanamide on other insects. Crude, unoiled [A **27** 158] dust was used.

In preliminary tests, larvae of *Melolontha* were placed in Petri dishes on dry powdered $CaCN_2$, on a paste of the dust and water, on dry blotting paper, and on wet blotting paper. Within 4 hours the larvae on the paste were dead, though not badly burned externally, while all the others remained active. Those on the dry powder survived for a week, though severely burned. It is concluded, therefore, that a toxic substance is formed when calcium cyanamide comes into contact with water and that caustic action is of only secondary importance. As larvae exposed to acetylene gas showed no reaction, toxicity could not have been due to the generation of acetylene from traces of calcium carbide in the crude calcium cyanamide. Furthermore, pure calcium cyanamide acted in the same way as the crude form. The larvae that died showed symptoms of a progressive paralysis, and their bodies became mummified. As this indicated that calcium cyanamide acted by ingestion and not by contact, the author injected orally a 3 per mille solution of pure calcium cyanamide into a number of larvae, and they died in 2–3 days with the symptoms already observed, whereas oral injections of pure water had no effect. To test the effect of soil on the toxic action, larvae were placed in plain earth or in earth mixed with calcium cyanamide. The latter was moistened with water, and the former with solutions of calcium cyanamide. The mortality was most rapid in the soil mixed with calcium cyanamide. In further tests, larvae were placed in soil in 10-inch flower pots. In some pots calcium cyanamide was mixed with the soil at the rate of 5 per cent., while in others a layer of calcium cyanamide, equal in amount to 5 per cent. of the soil, was spread over it. Mortality was very low, but was higher when the pots were watered. It is therefore concluded that in soil of more than a certain depth, the insecticide is prevented from coming into contact with all the larvae.

In a further experiment in which 50 adults of *Bruchus* (*Acanthoscelides*) *obtectus*, Say, were placed in Petri dishes containing a thin film of calcium cyanamide solution, all died in half an hour, while those in another batch in dishes containing a film of spring water were quite unaffected.

In experiments with adult house-flies, baits poisoned with calcium cyanamide proved effective, and it is considered that they would also be so against other insects.

Fischer (A.). *Spermophagus cisti* **F.** (**Syn.** *Bruchus cisti* **F.**) **als Schädling der Wildformen von** *Lupinus angustifolius* **L. und** *Lupinus luteus* **L.** [*Bruchus cisti* as a Pest of wild Forms of *Lupinus angustifolius* and *L. luteus*.]—*Z. PflKrankh.* **48** pt. 12 pp. 592–597, 5 figs., 7 refs. Stuttgart, 1938.

The cultivation of sweet lupins has increased enormously in Germany since 1931 ; in eastern Germany they are, with maize, the most important fodder plants. During an investigation in South Italy and Sicily, the original home of the yellow lupin, *Lupinus luteus*, and the blue lupin, *L. angustifolius*, which are the most important varieties in Germany, the author observed a very severe infestation of the seeds of the wild forms of *L. angustifolius* by a Bruchid, *Bruchus cisti*, F., the seeds of wild *L. luteus* being attacked to a less extent.

Kemper (H.). **Ueber den Saftkäfer** (*Carpophilus hemipterus* **L.**). [A Note on *C. hemipterus*.]—*Z. hyg. Zool.* **30** pt. 12 pp. 345–353, 5 figs., 9 refs. Berlin, December 1938.

The Nitidulid, *Carpophilus hemipterus*, L., which is a pest of dried fruit, occurs in most parts of the world. Four cases of harmful infestation by it in Germany during the past two years are mentioned. The egg is described in detail, apparently for the first time, and descriptions of the other stages and an account of its life-history are given, largely from the literature [*cf. R.A.E.*, A **3** 684 ; **19** 495 ; etc.]. In breeding experiments, the author found the pupae usually at the bottom of the receptacle or between the fruit, but rarely in the fruit. Larvae and pupae were sensitive to light, and pupae placed on dried fruit in a container and exposed to light gradually moved downwards. When larvae and adults were offered a choice of dried fruit they preferred figs ; plums were only slightly attacked ; and apricots and currants not at all, unless they were the only food available.

Weidner (H.). **Massenauftreten einer Chalcidide in Hamburg.** [A Mass Occurrence of a Chalcidid in Hamburg.]—*Z. hyg. Zool.* **30** pt. 12 pp. 359–363, 1 fig., 7 refs. Berlin, December 1938.

Very brief notes are given on four mass infestations of houses in Hamburg in autumn 1938 by *Stenomalus muscarum*, L., and three previous records of similar infestation from England and one from Switzerland are quoted from the literature. The adults are briefly described.

Peters (G.). **Chemisch-biologische Grundlagen der Unterdruck-Schädlingsbekämpfung (" Vacuumbegasung ").** [The chemico-biological Bases of Vacuum Fumigation.]—*Naturwissenschaften* **26** pt. 45 pp. 733–736, 6 figs. Berlin, 1938.

An increase in the effectiveness of vacuum fumigation against insect pests must depend on the introduction of improved fumigants with the least possible tendency to adsorption and capable of killing the eggs of insects more easily than the larvae and adults, and on improved apparatus ensuring thorough penetration of the insecticide into all parts of the infested material and yet capable of maintaining a pressure sufficiently low not to impair the biological effect produced by a vacuum on insects.

To secure adequate penetration of the fumigant, it is customary to raise the pressure somewhat by admitting air into the chamber soon after the insecticide has been introduced, and this entails renouncing the biological effect. In the author's experiments to overcome this difficulty, unnecessary loss by adsorption was avoided by filling the vacuum chamber with a uniform concentration of gas achieved by regular circulation of the gas-air mixture in the chamber. In order to ensure a high penetrative action without a reduction in the vacuum, the author made use of the fact that the circulation system permits the vacuum in the chamber to be subjected to variations in pressure without modifying the gas concentrations or unnecessarily adding to the residual amount of air. This is achieved by successive rapid changes in pressure that accelerate the penetration of the gas. A small compression chamber is fitted outside the vacuum chamber, and regular amounts of gas drawn out of the vacuum chamber to produce the change in pressure are compressed into this and released from it. The vacuum pump used for circulating the gas is attached to the compression chambers, and an automatic, electrically worked valve regulates the variations in pressure. A possible modification of this method consists in producing the requisite air movements by vibration.

Other experiments showed that the peculiar biological effect of vacuum fumigation is due to the combined action of a reduction in pressure and reduction in the amount of available oxygen [but see *R.A.E.*, A **25** 696].

TRAPPMANN (W.). **Bericht über die Tagung der " Arbeitsgemeinschaft zur wissenschaftlichen Förderung der Hausbockkäfer-Bekämpfung" im Staatlichen Materialprüfungsamt in Berlin-Dahlem (27-vi-1938).** [Report on the Meeting of the Association for the scientific Advancement of Control of *Hylotrupes bajulus* held on 27th June 1938 in Berlin.]—*Arb. physiol. angew. Ent. Berl.* **5** no. 4 pp. 297–364, 1 fig., refs. Berlin, 15th November 1938.

A brief notice of this meeting has already been published [*R.A.E.*, A **27** 6]. The following are short summaries of the papers read:

Schuch (K.). Ueber die Methodik und Ergebnisse der Prüfung von insektiziden Holzschutzmitteln im Laboratorium [On the Technique and Results of Laboratory Tests of insecticidal Wood Preservatives], pp. 300–305. To be effective against *Hylotrupes bajulus*, L., an insecticide must kill the larvae in the wood and prevent reinfestation. In laboratory tests of various liquid insecticides, holes were bored in one end (cross-section) of blocks of wood, 8 inches long and of the thickness usual in beams, etc., in houses, and average sized larvae were placed in them and allowed to feed undisturbed for some weeks under favourable conditions. The two ends were then coated with paraffin wax, and the block was dipped twice for a period of five seconds in the liquid under test. The amount absorbed was ascertained by weighing, and the treated block was allowed to stand for six months at 70–78 per cent. relative humidity. It was then split up to count the larvae, dead or living, and to measure the degree of penetration of the insecticide. A number of tests with Xylamon-LX-Natur, one of the Xylamon preparations [**25** 658] are described. As living larvae were found in parts to which the liquid had not penetrated, it is doubtful whether the fumes of this or other preparations with

a reputed respiratory action possess any insecticidal efficiency. Of 28 liquid washes tested, 13 were in the second year of trial, and of these 5 had been passed for experiments on a large scale. The hot-air process [*cf.* **21** 214; **27** 110] and fumigation with hydrocyanic acid gas are known to give control of infestation, but they do not prevent it.

Schulze (B.). Die technische Prüfung von Holzschutzmitteln [The technical Testing of Wood Preservatives], pp. 306–313. The author discusses many points that require consideration in tests of insecticidal and fungicidal wood preservatives, including the corrosion of metals, which may be immediate (boilers, containers) or delayed (nails in woodwork), and their possible effect on subsequent painting or polishing of treated wood. *H. bajulus* has up to now been the only insect pest used in tests of wood preservatives, but Anobiids, which have a shorter development, have proved suitable subjects for tests [see below, paper by Becker].

Motzkus (E.). Grundlagen für die Prüfung des Einflusses von Holzschutzmitteln auf die Brennbarkeit des Holzes [The Principles for testing the Effect of Wood Preservatives on the Inflammability of Wood], pp. 313–318. The effect on the inflammability of wood is of decisive importance in the evaluation of wood preservatives. Investigations are briefly described that permit the selection of comparable samples of wood for experiment.

Kaufmann (O.). Folgerungen aus der Hausbockstatistik [Conclusions drawn from Statistics on *H. bajulus*], pp. 318–332. The author discusses the figures obtained in an official survey of buildings in Germany [**27** 6] for infestation by *H. bajulus* and considers that control on a national basis is required. The increasing use of unseasoned soft sapwood of rapid growth favours the beetle and indicates a future increase in attack unless the wood can be protected before use.

Hespeler (O.). Wie können die in Lübeck gemachten Erfahrungen über die technische Hausbockkäfer-Bekämpfung für das Reich verwertet werden? [How can the technical Experience gained in Lübeck in the Control of *H. bajulus* be utilised in Germany?], pp. 332–337. Kerkow (—). Wie können die in Hamburg gemachten praktischen Erfahrungen über die technische Hausbockbekämpfung für das Reich verwertet werden? [How can the practical Experience gained in Hamburg in the Control of *H. bajulus* be utilised in Germany?], pp. 337–342. In these papers are discussed official measures against *H. bajulus* taken in the Free States of Lübeck and Hamburg [**24** 612].

Kaufmann (O.). Bewertung der insektiziden Holzschutzmittel auf Grund der Grossversuche [The Evaluation of insecticidal Wood Preservatives on the Basis of large-scale Experiments], pp. 342–347. In July and October 1937, an inspection was made of about 100 attics in Hamburg and Lübeck that had been treated with proprietary insecticides to combat *H. bajulus*. Only those buildings were included in which a flight period of the Cerambycid could have occurred since the treatment. The insecticides are graded, subject to many qualifications, according to the results.

Schwarz (C. L.). Holzschutz in Gebäuden und Hygiene [Wood Preservation in Buildings and Hygiene], pp. 347–352. This is a discussion of the possible effects of the use of various kinds of insecticides against *H. bajulus* on the operators applying them, on man

and domestic animals, and on food-stuffs stored in rooms that have been treated.

Schuch (K.). Ernährungsphysiologische Untersuchungen über den Hausbockkäfer und Folgerungen für die Praxis [Investigations on the Physiology of Nutrition in *H. bajulus* and practical Conclusions], pp. 352–356. The larvae of *H. bajulus* attack sapwood almost exclusively, and they rarely tunnel in heartwood [**25** 499 ; **26** 91]. At the present time, constructional timber is largely obtained from young trees, and as young round-wood is of too small a diameter to allow of shaping to sharp-edged beams, it follows that sapwood is almost always present. Heartwood, especially in pines, only begins to form after 20–30 years of growth, so that rafters nowadays often contain only a negligible proportion of heartwood.

Becker (G.). Die Prüfung der insektiziden Wirkung von Holzschutzmitteln mittels *Anobium punctatum* De Geer (=*A. striatum* Oliv.) als Versuchstier [The Testing of the insecticidal Effect of Wood Preservatives, using *A. punctatum* as the Test Insect], pp. 357–360. *Anobium punctatum*, DeG., has been found very suitable for testing the insecticidal effect of wood preservatives. This paper describes the technique adopted.

Franzke (A.). **Die Hausbockkäferfrage im Jahre 1938.** [The Question of *Hylotrupes bajulus* in Germany in 1938.]—pp. 3–17, Berlin, Verb. öff. FeuerversichAnst, 1938.

Kaufmann (O.) & Schuch (K.). **Folgerungen aus der deutschen Hausbockkäferstatistik.** [Conclusions from German Statistics on *H. bajulus*.]—*T.c.* pp. 19–26, 4 figs., 6 refs.

Schuch (K.). **Zur Physiologie und Oekologie des Hausbockkäfers (*Hylotrupes bajulus* L.).** [The Physiology and Ecology of *H. bajulus*.]—*T.c.* pp. 28–35, 8 figs., 16 refs.

The first of these papers is a comprehensive review of the question of infestation of buildings in Germany by *Hylotrupes bajulus*, L., and begins with a historical note on infestation in the past. The statistics collected in Germany in 1936–37 [*cf. R.A.E.*, A **27** 6] are described and discussed. They have shown the infestation to be widespread and likely to increase, and it is concluded that official action should be taken throughout Germany.

The subject matter of the second paper is substantially the same as in the paper by Kaufmann noticed in the preceding abstract, and the information in the third is covered by other papers by its author [**25** 499 ; **26** 91 ; and preceding abstract].

Leib (E.). **Tierische und pilzliche Schädlinge an Park- und Alleebäumen.** [Animal and Fungous Pests of Park and Avenue Trees.]—*Kranke Pflanze* **15** pt. 12 pp. 212–215, 1 pl. Dresden, December 1938.

In connection with the unusually severe infestation of ornamental trees in the Saar territory, Germany, in 1937 by insect and fungous pests, brief notes are given on the bionomics and control of *Caliroa (Eriocampoides) annulipes*, Klug, on lime, and *Tischeria complanella*, Hb., on oak.

Diakonoff [A.] & others. **Voorloopige mededeeling over de bestrijding van de ringelrups en van de bastaardsatijnvlinder in de stad Amsterdam in 1938.** [Preliminary Communication on the Control of *Malacosoma neustria* and *Nygmia phaeorrhoea* in Amsterdam in 1938.]—*Tijdschr. Ent.* **81** no. 3–4 pp. lxxxi–lxxxiv. Amsterdam, December 1938.

In view of the damage caused to ornamental trees in Amsterdam by larvae of *Nygmia phaeorrhoea*, Don., and *Malacosoma neustria*, L., of which the latter is the more injurious, investigations were carried out in 1938 on the degree of control exercised over them by parasites. Proctotrupid egg parasites were of very little importance, for only 4,792 adults were bred from 1,613 egg clusters of *M. neustria* ; at the very low estimate of 200 eggs per cluster, only 1·5 per cent. were parasitised. Parasitism by Braconid larval parasites, probably *Meteorus* sp. and *Apanteles* sp., did not exceed 1 per cent., while under the most favourable conditions Tachinids parasitised only 10–11 per cent. of the larvae [*cf. R.A.E.*, A **26** 529].

In addition to a few examples of *Meteorus* sp., two Chalcidoids, *Monodontomerus* sp., and *Eupteromalus* sp., were bred from larvae of *N. phaeorrhoea* from winter nests [*cf.* **22** 210], but the percentage parasitism by them averaged only 0·7, the maximum being 1·5.

Takahashi (R.). **On the Galls of *Melaphis chinensis* Bell in Formosa.** [*In Japanese.*]—*Bull. Govt Res. Inst. Formosa* no. 148, 12 pp., 4 figs. Taihoku, Formosa, December 1938.

Melaphis chinensis, Bell, the migrant and nymphs of which are described, causes galls on the lower surface of the leaves of *Rhus javanica* var. *roxburghi* in Formosa [*cf. R.A.E.*, A **26** 264]. The dried galls contain 70·04 per cent. tannin, and investigations on the possibility of using them commercially were made in 1938. This Aphid occurs in the mountainous region of northern Formosa, and the alate forms emerge from the galls, from mid-September, and migrate to mosses of the genus *Mnium*, on which they reproduce. In the laboratory, the migrants also produced young on another moss, but the nymphs died within 2 days. The galls are formed mostly on trees of moderate size, are less common on old trees, and do not occur on young ones. *Nurudea shiraii*, Mats., also causes galls on the same tree, and these, when dried, contained 58·64 per cent. tannin. This Aphid is very common throughout the Island up to about 5,000 ft. above sea level.

Miwa (Y.). **On the Javanese Beetle introduced into Formosa for the Control of the Banana Weevil.** [*In Japanese.*]—*Formosan agric. Rev.* **34** pp. 557–565, 2 figs. Taihoku, Formosa, October 1938.

Popular accounts are given from the literature of the banana weevil, *Cosmopolites sordidus*, Germ., and of *Plaesius javanus*, Er., which was introduced into Formosa from Java in 1938 for its control. About 70–75 per cent. of the adult predators were alive on arrival. Some were liberated, and others kept in captivity gave rise to new adults in early July.

SONAN (J.). **The Cherry Tree Notodontid Moth.** [*In Japanese.*]—*Formosan agric. Rev.* **34** pp. 632–635, 1 fig. Taihoku, Formosa, November 1938.

The larvae of *Phalera flavescens*, Bremer & Grey, all stages of which are described, cause serious injury to cherry and loquat (*Eriobotrya japonica*) in northern Formosa. This Notodontid has over two generations a year. Females of the overwintered generation oviposit in May, and the first-generation larvae pupate in the soil in late June, the adults emerging in July and August. Second-generation larvae pupate in September.

MISAKA (K.) & KOREISHI (K.). **Studies on the Infestation of Fruit-flies on Formosan Fruits and Vegetables. 1. Infestation of Persimmon.** [*In Japanese.*]—*Res. Bull. Pl. Quar. Sta. Formosa* no. 3, 12 pp., 2 pls. Taihoku, Bur. Ind. Govt Formosa, Publ. no. 829, 1938. **2. Infestation of Papaya Fruit.**—*Op. cit.* no. 4, 34 pp., 3 pls. Publ. no. 830, 1938.

In the first paper, the authors state that females of *Dacus ferrugineus dorsalis*, Hend., oviposited in fruits of persimmon (*Diospyros kaki*) in the field in Formosa, and that adults emerged, but in experiments, the eggs did not all hatch and only some of the larvae matured [*cf. R.A.E.*, A **26** 263]. Infested fruits can be detected one day after oviposition. Fruits in barrels decay, even if one is infested, but the fly is also destroyed. *D. cucurbitae*, Coq., does not attack persimmon.

In the second paper, it is stated that although *D. f. dorsalis* does not infest papaya fruits in the field, in the laboratory, females oviposited on very ripe ones. Females of *D. cucurbitae* occasionally oviposit in wounded or diseased parts of very ripe fruits.

TAKAHASHI (H.). **Soil Characters of Sugar-cane Fields and Distribution of Soil Insects.** [*In Japanese.*]—*J. Formosan Sug. Plant. Ass.* **16** no. 12 pp. 336–344. Taichu, Formosa, December 1938.

In investigations in Formosa, 29 species of insects were found in sandy soil and 22 in humus soil in sugar-cane fields. Of these, *Brachytrypes portentosus*, Licht., *Gryllotalpa formosana*, Shir., *Lacon musculus*, Cand., *L. setiger*, Bates, *Cardiophorus* (*Platynychus*) *formosanus*, Mats., and *Aserica* (*Autoserica*) *formosae*, Brenske, were much more numerous in the sandy soil, while some Scarabaeids were more numerous in the humus soil.

TAKAHASHI (H.). **On the Relation of the Degree of Growth of Sugar-cane to the Oviposition of and the Heart-withering caused by Borers. 1.** *Diatraea venosata* **Walk. and** *Chilo infuscatellus* **Snellen.** [*In Japanese.*]—*J. Formosan Sug. Plant. Ass.* **16** no. 12 pp. 321–335. Taichu, Formosa, December 1938.

Investigations in Formosa have shown that 50 per cent. of the egg-masses of *Diatraea venosata*, Wlk., are found on sugar-cane leaves 24–39 ins. long. Next in order of preference are those of 12–24 and 39–58 ins. Withered hearts caused by this borer were most numerous on cane stalks of over 20 ins. in length. *Chilo infuscatellus*, Sn., most frequently oviposits and causes most withered hearts in stalks 1–2 ft. long.

NAWA (U.). **On the Prevention and Control of** *Cnidocampa flavescens* **Walk., 1 & 2.** [*In Japanese.*]—*Insect World* **42** pp. 314–318, 344–349. Gifu, Japan, October–November 1938.

Monema (*Cnidocampa*) *flavescens*, Wlk., all stages of which are described, is common in Japan, where it feeds on many trees, including persimmon, pear, apple, plum, tea, willow and loquat (*Eriobotrya japonica*). Injury to persimmon is sometimes severe, and badly damaged trees take over two years to recover. This Limacodid usually has only one generation a year, but when the adults emerge early, a second sometimes develops. The adults emerge from June to August or September, and females oviposit soon after pairing; they survived for a week in captivity. The eggs, which are laid singly on the lower surface of the leaves, usually one per leaf, hatch in about 10 days. The larvae feed separately and cause most injury in July and August. They moult four times and become full-fed in 35 days on an average. They hibernate in cocoons and pupate in the following spring, the pupal stage lasting about 20 days. *Polistes*, *Mantis* and Carabid beetles prey on the larvae. Spraying with pyrethrum soap solution or Bordeaux mixture with lead arsenate and calcium caseinate is recommended for control.

SAKAI (K.). **On the Conditions of Infestation by** *Chrysomphalus aurantii* **Mask. on** *Citrus* **Fruits.** [*In Japanese.*]—*Kagoshima agric. Exp. Sta. Extra Rep.* no. 2, 12 pp. Kagoshima, Japan, October 1938.

Aonidiella (*Chrysomphalus*) *aurantii*, Mask., is an important pest of *Citrus* in Kagoshima Prefecture, Kyushu, Japan; the adults and larvae hibernate, and there are usually three, and sometimes four, generations a year. The crawlers migrate to the fruits from July onwards, and individuals of all stages are found on them from late August to the end of October, second-instar larvae being the most numerous at harvest. Control measures must be applied from late July to early August if a good crop is to be obtained.

KURODA (M.). **Some ecological Notes on** *Phytomyza nigricornis* **Macquart.** [*In Japanese.*]—*Kontyû* **12** no. 5 pp. 163–165, 1 fig. Tokyo, 1938.

Phytomyza affinis, Fall. (*nigricornis*, Macq.), which attacks crucifers and composites in Japan, has three spring and two autumn generations, the insects entirely disappearing during summer. They hibernate in the pupal stage in the leaves. The adult flies emerge from mid-March, usually live about two weeks, and oviposit in the leaves. The larvae hatch in 3–11 days and mine the leaves from early April. The larval and pupal stages last 6–13 and 7–17 days, respectively. The numbers of larvae present are greatest at an average daily temperature of 15–20°C. [59–68°F.] and decrease below 10 [50°F.] and above 20°C.

KOYAMA (T.). **The Life-history of the Rice Stem Maggot** (*Chlorops oryzae* **Mats.**) **occurring in Akita Prefecture.** [*In Japanese.*]—*Oyo Kontyû* **1** no. 2 pp. 54–60, 5 figs. Tokyo, November 1938.

In Akita Prefecture, *Chlorops oryzae*, Mats., all stages of which are briefly described, has two generations a year [*cf. R.A.E.*, A **25** 225].

It hibernates in the larval stage in the stems of grasses, and the overwintered larvae pupate in late May. The adults, which emerge in June and again from late August to the end of September, live about 20 days on an average. They emerge mostly in the early morning and pair soon afterwards. Females lay about 100 eggs 3–15 days after emergence singly on the leaves of rice or related grasses, usually one per stem. The larvae, which hatch in about five days, feed on the leaves and undeveloped ears, sometimes causing serious damage. There are three larval instars, and the pupal period lasts about two weeks.

Miyake (T.). **Bionomics of the Bean Weevils or Bruchids (Rep. 1), with Notes on the structural Characters of the important Species of Beetles found when Plants were quarantined.** [*In Japanese.*]—*Oyo Kontyû* **1** no. 2 pp. 61–70, 1 pl. Tokyo, November 1938.

Some Bruchids that attack beans in Japan always have one generation a year, the adults hibernating for a definite period and ovipositing on the pods. Examples of this group are *Bruchus pisorum*, L., *B.* (*Bruchidius*) *terrenus*, Sharp, and *B. rufimanus*, Boh., which does not occur in Formosa, possibly owing to the fact that the temperature of the island is too high to permit the necessary diapause. Others, including *B. chinensis*, L., have varying numbers of generations under different climatic conditions, have no definite diapause, and oviposit on the seeds. *B. chinensis* is widely distributed in Japan, but does not occur in Hokkaido north of the mainland, as it cannot survive the cold winter there.

Descriptions are given of Bruchids intercepted in imported beans, including *Bruchus* (*Callosobruchus*) *analis*, F., *B. maculatus*, F. (*C. quadrimaculatus*, F.), and *B.* (*Acanthoscelides*) *obtectus*, Say.

Onoe (T.) & Akabori (J.). **Soy Bean Flour as a substitute for Calcium Caseinate. 1.** [*In Japanese.*]—*Oyo Kontyû* **1** no. 2 pp. 71–76. Tokyo, November 1938. (With a Summary in English.)

In this laboratory study, soy-bean flour and calcium caseinate were compared with respect to their powers of improving suspensions of lead arsenate in water. It was shown that 0·04 per cent. calcium caseinate was superior to 0·05 per cent. soy-bean flour, but when 0·1 per cent. of the latter and 0·07 of the former were added, the conditions of suspension were almost the same. As greater concentrations are added, the soy-bean flour becomes superior. In general, soy-bean flour is equal in effectiveness to an equal amount of calcium caseinate.

Isitani (H.). **The Leaf-miners of Barley and Wheat found near the Environs of Tokyo.** [*In Japanese.*]—*Oyo Kontyû* **1** no. 3 pp. 101–109, 11 figs. Tokyo, 1938.

Notes are given on the bionomics of various leaf-mining Diptera that injure barley and wheat near Tokyo, together with descriptions of the adults and keys for their identification. *Phytomyza nigra*, Mg., chiefly injures wheat, but also causes damage to barley, oats and other grasses, especially *Alopecurus*. It has several generations a year. *Cerodontha denticornis*, Mg., causes slight injury, mainly to barley; adults emerge in early May and again a month later. *Agromyza* sp., which also infests barley, has 2 or 3 generations a year and hibernates

in the pupal stage. The eggs are laid singly on the leaves and hatch in about 4 days. The larvae mine into the leaves, become full-fed in 7–10 days, and pupate on the stalks or in the soil, the adults emerging 10 days later in summer. Barley is also attacked by two other Agromyzids; one of these is rare, and the adults of the other appear in late April and again in late May.

MIZUTANI (Y.). **On** *Oraesia emarginata* **Fab.** [*In Japanese.*]—*Oyo Kontyû* **1** no. 3 pp. 110–113, 2 figs. Tokyo, 1938.

Adults of the Noctuid, *Calpe* (*Oraesia*) *emarginata*, F., which emerge from late May to early June and in September, feed on the juices of various fruits in Wakayama Prefecture, where it has probably two generations a year. The larvae feed on *Cocculus trilobus*.

SAITO (S.). **Seasonal Change of Oviposition-sites of the Apple Mite in Hokkaido.** [*In Japanese.*]—*Oyo Dobuts. Zasshi* **10** no. 5 p. 191. Tokyo, November 1938.

The species of *Tetranychus* that infests apple in Hokkaido migrates from the leaves to the branches, when the temperature decreases, and oviposits on them at the end of September, when there is an average temperature of 10°C. [50°F.].

KAMIYA (K.). **On the Biology of** *Apanteles liparidis* **Bouché.** [*In Japanese.*]—*Oyo Dobuts. Zasshi* **10** no. 5 pp. 196–199. Tokyo, November 1938.

As a result of further work on the bionomics of *Apanteles liparidis*, Bch., which parasitises *Dendrolimus spectabilis*, Btlr., on pine in Japan [*cf. R.A.E.*, A **23** 131], the author states that this Braconid occurs in areas in which trees other than pine are also grown, but not in pure pine forests, since for development it requires the alternate host, *Lymantria dispar*, L. The larvae that overwinter in *L. dispar* pupate from late March near Tokyo, the adults emerging from mid-April. Females that emerge from *L. dispar* in early July oviposit in *D. spectabilis*. Development is slow, and only young larvae of *Dendrolimus* are parasitised.

SAWA (R.). **Two Observations on the Occurrence of** *Chilo simplex* **Butl. in flooded Areas.** [*In Japanese.*]—*Oyo Dobuts. Zasshi* **10** no. 6 pp. 245–249. Tokyo, December 1938.

Investigations in Japan showed that the numbers of first-generation adults of *Chilo simplex*, Btlr., taken at light in ricefields were much less in those fields in which the rice plants had been completely submerged in the preceding year; they gradually increased, however, and were normal two years after the flood. In fields in central Japan in which the rice was entirely submerged for six days owing to heavy rains in June 1938, 80·6–87·4 per cent. of the injured stalks were found to contain no larvae, 6·4–8·2 per cent. contained dead larvae, and only 6·2–11·3 per cent. contained living ones; consequently, the moths of the second generation were much less numerous than usual.

KOBAYASHI (M.) & TAMURA (I.). **Differences in the Degree of Infestation by Adult Beetles of** *Anomala rufocuprea* **Motsch. of the Varieties of Soy Bean.** [*In Japanese.*]—*Agric. & Hort.* **14** no. 1 pp. 37–40, 3 figs. Tokyo, January 1939.

Varieties of soy bean that have leaves covered with brown hair are stated to be the least injured by adults of *Anomala rufocuprea*, Motsch., those having hairless leaves and those with white-haired leaves coming next in order of resistance. The shorter-stalked varieties are generally less injured than the others.

OHTA (Y.). **On** *Pyrausta phoenicealis* **Hübner.** [*In Japanese.*]—*Insect World* **43** no. 1 pp. 8–14. Gifu, Japan, January 1939.

Further investigations on *Pyrausta phoenicealis*, Hb. [*cf. R.A.E.*, A **26** 771], all stages of which are described, showed that it has three generations a year near Gifu, the adults emerging in June, July and August. The overwintered larvae begin to feed on the young leaves of *Perilla ocymoides* f. *purpurea*, which is used as a vegetable, from early May and become full-fed in about 13 days. A female lays from two to three hundred eggs singly on the leaves; these hatch in about six days, and the pupal stage lasts about seven on an average. Two species of *Apanteles* parasitise the larvae, and the larvae of a Carabid prey upon them.

TAKAHASHI (T.) & TSUMAGARI (H.). **Manual of Tobacco Insects of Japan.** [*In Japanese.*]—131 pp., 58 pls. Tokyo, 1938. Price *Yen* 3.

This manual on pests that attack tobacco plants or stored tobacco in Japan contains popular accounts of the morphology, bionomics and control of 50 species of insects, together with information on their natural enemies. The most injurious are *Anomala rufocuprea*, Motsch., *Agriotes sericeus*, Cand., *Scepticus insularis*, Roel., *Psylliodes angusticollis*, Baly, *Epilachna vigintioctomaculata*, Motsch., *Lasioderma serricorne*, F., *Attagenus japonicus*, Reitt., *Thrips tabaci*, Lind., *Nephrotoma virgata*, Coq., *Arctia caja*, L., *Barathra brassicae*, L., *Prodenia litura*, F., *Empoasca* (*Chlorita*) *flavescens*, F., *Myzus persicae*, Sulz., and *Gryllotalpa africana*, P. de B. The larvae of *Pieris rapae*, L., sometimes migrate to tobacco from neighbouring cruciferous plants.

MAEDA (T.). **Observations on the Rose-stem Sawfly,** *Neosyrista similis* **(Hym. Cephidae). 1 & 2.** [*In Japanese.*]—*Kontyû* **12** no. 6 pp. 185–193, 1 pl., 1 fig. Tokyo, December 1938; *op. cit.* **13** no. 1 pp. 16–20, 4 figs. January 1939. (With a Summary in English.)

The following is based on the author's summary of this paper on the bionomics of the rose sawfly, *Neosyrista similis*, Mocs., near Tokyo, some of the information in which is similar to that already noticed [*R.A.E.*, A **25** 227].

There is only one generation a year. The overwintered larvae pupate in mid-April, and the adults emerge about 12 days later. Females oviposit from late April to mid-May in slits in the shoots of rose, which they girdle. Generally only one egg is laid in a shoot,

although 2–5 incisions may be made. The larvae hatch in about a week and bore in the twigs, advancing towards the tips. Later they retrace their course and pupate in cocoons about mid-June in chambers just below the point at which the twig was girdled, in which they overwinter. The end of the infested twig falls off. Near Tokyo, adults emerged about 20th April, but further north, at Hirosaki, in Aomori Prefecture, they did not do so until about 10th May. Adults kept without food or water survived for up to 4 days. Parasites bred from the larvae comprised one species each of *Pimpla* (*Exeristes*), *Pimpla* (*sens. strict.*), *Cryptus* and *Eupelmus*.

The only available measures of control are to capture the adults, and to cut off and destroy infested shoots. The author states that a rose-garden in Tokyo in which the latter method has been employed since 1934 is now free from infestation. Spraying with naphthalene did not repel ovipositing females.

KAMIYA (K.). **Notes on the Hymenopterous Parasites of the Pine-caterpillar,** *Dendrolimus spectabilis* **Butler.** [*In Japanese.*]—*Kontyû* **12** no. 6 pp. 201–203. Tokyo, December 1938.

A list is given of 18 parasites of various stages of *Dendrolimus spectabilis*, Btlr., with very brief notes on some of them. The egg parasites include *Anastatus albitarsis*, Ashm., and *A. bifasciatus*, Boy. *Stenaraeoides octocinctus*, Ashm., parasitises the larvae, but not the pupae. *Apanteles liparidis*, Bch., which parasitises the larvae, is itself parasitised by *Hemiteles chosensis*, Uchida, *H. kumamotensis*, Uchida, and *Gelis* (*Pezomachus*) *asozanus*, Uchida. *Rhogas dendrolimi*, Mats., another parasite of the larvae, is parasitised by *Monodontomerus dentipes*, Boh., and *Phygadeuon latipetiolator*, Uchida, while *Rhythmonotus takagii*, Mats., is parasitised by *M. dentipes*, *Brachymeria obscurata*, Wlk., and *Pimpla* (*Exeristesoides*) *spectabilis*, Mats. The parasites of the pupae include *Pimpla disparis*, Vier., *P. pluto*, Ashm., *Theronia atalantae*, Poda, *M. dentipes*, and *B. obscurata*.

KÔNO (H.). **Ueber die Lebensweise von** *Prociphilus oriens* **Mordvilko und** *P. konoi* **Hori. 1.** [On the Bionomics of *P. oriens* and *P. konoi*. 1.] [*In Japanese.*]—*Kontyû* **12** no. 6 pp. 210–211. Tokyo, December 1938.

In Hokkaido, the Aphid, *Prociphilus oriens*, Mordv., migrates from the leaves of its primary food-plants, *Fraxinus* spp. and *Syringa* sp., to the main roots of *Abies sachalinensis*, to which it causes serious damage. *P. konoi*, Hori, attacks *Lonicera* spp. and migrates to the roots of *Picea jezoensis* and *P. glehni*.

KÔNO (H.) & SUGIHARA (Y.). **Insect Damage as a Factor affecting the second Blossom of the Japanese Cherry Trees in the Vicinity of Tokyo.** [*In Japanese.*]—*Kontyû* **12** no. 6 pp. 227–229. Tokyo, December 1938.

The authors state that in Hokkaido and near Tokyo, cherry trees entirely defoliated by larvae of the Notodontid, *Phalera flavescens*, Bremer & Grey, blossom again in the same season.

KUMAZAWA (T.). **Life-history of** *Arthrochlamys spilota* **Baly.** [*In Japanese.*]—*Kontyû* **13** no. 1 pp. 4–15, 6 figs. Tokyo, January 1939.

Near Tokyo, *Arthrochlamys spilota*, Baly, which attacks rhododendrons, has one generation a year. The larvae hibernate, begin to feed in April and pupate in late May. The adults emerge from the end of June to mid-August; females oviposit from late August to early October, and then hibernate, emerging in spring and ovipositing again from late April to July. Individuals of this summer generation become adult in late August and hibernate without ovipositing. Thus, this Cryptocephalid hibernates in both the larval and the adult stage, and some of the adults have oviposited.

Pairing occurs 3–17 days after emergence. The eggs are laid singly on the twigs, or sometimes on the leaves, and are covered with excreta, which form a chamber within which the larvae feed and pupate. *Rhododendron obtusum* and *R. lateritium* are the preferred food-plants, other species of the genus being attacked to a less degree or not at all. *Tetrastichus* sp. parasitises the eggs and *Eupelmus* sp. the larvae.

LEVER (R. J. A. W.). **Division of Entomology—Annual Report for 1937.**—*Annu. Bull. divl Reps Dep. Agric. Fiji 1937* pp. 25–27. Suva, 1938.

Some of the information in this report on work in Fiji in 1937 has already been noticed [*R.A.E.*, A **26** 58, 59, 334]. *Dacus* (*Chaetodacus*) *passiflorae*, Frogg., was reared for the first time from fruits of *Eugenia uniflora* (*micheli*) and *Barringtonia speciosa*, and *Dacus* (*Notodacus*) *xanthodes*, Broun, was observed in granadilla in December. Both these Trypetids and the fruits on which they feed were scarce from July onwards. The parasites, *Tetrastichus giffardianus*, Silv., and *Dirhinus* sp. [*cf.* **26** 59] took 14–19 and 18–26 days, respectively, to complete their development within the host. *Tetrastichus* attacks Trypetids only, and up to six offspring of one female emerged from a single host larva [*cf.* **24** 768]. *Dirhinus* was bred from pupae of *Musca* and *Sarcophaga*; it has been liberated locally, and consignments have been sent to the Cook Islands and Samoa. Of the two native Braconid parasites, *Biosteres* sp. was more abundant than *Opius fijiensis*, Fullaway [*cf.* **24** 768].

Consignments of *Plaesius javanus*, Er., were sent to Jamaica (by air mail from San Francisco), Tahiti and the Cook Islands for the control of *Cosmopolites sordidus*, Germ., and of *Teleonemia lantanae*, Dist., to New Caledonia, Tonga and the New Hebrides for the control of *Lantana*.

Pests of coconut recorded during the year included the Cossid, *Acritocera negligens*, Btlr., which damaged the female flowers in Taveuni and Vanua Levu [*cf.* **18** 618], *Levuana iridescens*, B.-B., over 60 per cent. of the larvae of which in Vunidawa were parasitised by *Ptychomyia remota*, Aldr. [*cf.* **25** 447], and *Decadarchis psammaula*, Meyr., and *Decadarchis* sp., which attacked the leaves. *Aspidiotus destructor*, Sign., was attacked by the predator, *Cryptognatha nodiceps*, Mshl. [*cf.* **23** 280] in southern Viti Levu. *Necrobia rufipes*, deG., was recorded on copra, and *Coptotermes acinaciformis*, Frogg., was found at a wharf, infesting piles and staging made from *Eucalyptus paniculata*.

PARHAM (B. E. V.). **The Cultivation of Bananas.**—*Agric. J. Fiji* **9** no. 3 pp. 6–7. Suva, September 1938.

Considerable damage is caused to bananas in Fiji by the scab moth [*Nacoleia octasema*, Meyr.] ; infestations are controlled satisfactorily by dusting with a mixture of pyrethrum powder and sulphur or wood ash (1 : 2) as soon as possible after the bud is shot and before it passes the horizontal position [*cf. R.A.E.*, A **20** 605].

Banana plants infected with bunchy-top [*cf. loc. cit.*], the virus of which is transmitted by *Pentalonia nigronervosa*, Coq., should be treated immediately by applying ½ pint kerosene to the crowns to kill the Aphids, and then removed [*cf.* **23** 71].

LEVER (R. J. A. W.). **Entomological Notes.**—*Agric. J. Fiji* **9** no. 3 pp. 19–24, 1 graph, 13 refs. Suva, 1938.

The native Braconid parasites [*R.A.E.*, A **24** 768] of *Dacus* (*Chaetodacus*) spp. have been identified as *Biosteres tryoni*, Cam., and *Opius fletcheri*, Silv. ; a third parasite, *Phaenocarpa* sp., has recently been taken on Viti Levu and Taveuni Islands. The developmental period in days of the three introduced parasites, *Tetrastichus giffardianus*, Silv., *Dirhinus* sp., and *Syntomosphyrum indicum*, Silv., within the host was, on the whole, inversely proportional to the temperature. As many as 35 individuals of *S. indicum* were reared from one host larva. Of the parasites of *Cryptophlebia* [*Argyroploce illepida*, Btlr.] in Fiji [**26** 497], the Tachinid has been identified as *Carcelia kockiana*, Tns., and the larger Braconid as *Macrocentrus* [*calacte*] [see **27** 19].

In June 1938, larvae of *Cirphis unipuncta*, Haw., caused some injury to rice ; an arsenical bait was applied. In August, some slight damage to tobacco was caused by *Agrotis ypsilon*, Hfn., which had not previously been recorded from Fiji.

Stored copra has recently been attacked by larvae of *Necrobia rufipes*, deG.], and larvae of *Ephestia cautella*, Wlk., were observed on a particularly good sample which had been kept as an exhibit. The general measures of control outlined have already been noticed [**26** 31]. *E. cautella* was parasitised by *Microbracon hebetor*, Say, and up to 10 or 11 adult parasites were reared from one host larva.

In July and August, larvae of *Aeolarchis sphenotoma*, Meyr., attacked leaves of *Pandanus* spp., particularly *P. caricosus*, which are used for making mats ; the pupal stage was passed within a web on the surface of the leaf. The application of pyrethrum powder and lime or wood ash (1 : 3) was recommended for control. This Tineid was parasitised by a Syrphid, probably a species of *Melanostoma*, and a minute Chalcid. In July, adults of the Tineid, *Decadarchis heterogramma*, Meyr., were reared from larvae on enveloping spathes of coconut, on the outer surface of which the larvae pupated in a web. This species had previously been recorded feeding on dead tissue of coconut leaflets and on pupae of *Tirathaba trichogramma*, Meyr.

SCHIUMA (R.). **Informe sobre " Tucuras ".** [Report on Grasshoppers.] —*Publ. misc. Minist. Agric. Argent.* no. 43, 119 pp., 4 pls., text ill. Buenos Aires, 1938.

Amongst the grasshoppers that have recently become important pests in the Province of Buenos Aires, *Trigonophymus arrogans*, Stål, all stages of which are described, is the most important.

This species oviposits in summer, but the eggs do not hatch until the following spring; in experiments the incubation period lasted about 250 days. Hoppers appear in October–December, and the hatching period may extend into January and February. It is facilitated by high humidity, but may also occur in dry soil. After undergoing five moults, the hoppers become adult in 45–55 days, and 20–30 days later the adults pair and lay eggs. Egg-deposits are found particularly in low-lying lands with a hard soil and overgrown by short grass with thick fibrous roots. Higher ground where the soil is lighter is avoided, and scarcely any eggs are found in cultivated areas, except in lucerne fields. Each egg-pod contains from 32–40 eggs, and up to five egg-pods may be laid by one female.

In its habits *T. arrogans* is gregarious, but does not migrate unless forced to do so by lack of food. Wild grasses constitute the main diet of the hoppers in the first days of their life, and in years with good rainfall the damage may be restricted to pastures. In dry years, however, the hoppers migrate to adjoining cultivated areas. Cereals, lucerne, Sudan grass, flax and many other crops may be destroyed, though cucurbits appear to be avoided.

Natural enemies of *T. arrogans* include *Hexamermis* sp. (probably *H. acridiorum*, Weyenb.) which may infest up to 90 per cent. of the grasshoppers and two Sarcophagid flies (*Opsophyto arteagai*, Blanch., and *Sarcophagulopsis trigonophymi*, Blanch.). One of the major controlling factors is the early drying-up of wild grasses in dry years, when great numbers of hoppers die from starvation. Torrential rain has little effect on them.

Experiments with various contact insecticides (fuel oil, soap, and proprietary preparations) showed that one proprietary powder was suitable for practical destruction of smaller hoppers. Barriers are of restricted use owing to the mainly sedentary habits of the pest, but flame-throwers give good results. The principal method of control is, however, the destruction of egg-pods by deep ploughing and disk-harrowing, though this method gives only partial results in compact soils with thick-rooted grasses.

Observations on the life-cycle and descriptions of the stages of two other species, *Elaeochlora viridicata*, Serv., and *Dichroplus* sp. are appended.

[Rimskiĭ-Korsakov (M. N.).] **Римский-Корсаков (М. Н.). Twenty Years of Progress in Entomology.** [*In Russian.*]—*Priroda* **26** no. 10 pp. 206–212. Leningrad, October 1937. [Recd February 1939.]

In the course of the last 20 years, there has been a great increase in the Russian Union of the areas under various crops and much attention has also been devoted to the cultivation of orchards, afforestation and to cattle breeding. Simultaneously, the question of the control of different insect pests attacking cultivated plants, forests, domestic animals and man has become of primary importance, and investigations in this respect have been carried out on a large scale. A brief review of the resulting literature is here given, most of which has been noticed in this *Review* from the originals.

[Rekach (V. N.).] **Рекач (В. Н.). Cotton Aphids of the South of the European Part of the R.S.F.S.R.** [*In Russian.*]—La. Cr. 8vo 111 pp. 23 figs., 341 refs. Pyatigorsk, 1938. (With a Summary in English.)

An account is given of investigations carried out from 1st May 1936 to 1st June 1938 on the bionomics of Aphids attacking cotton in the regions of Krasnodar (northern Caucasus) and Ordzhonikidze (central Caucasus), Daghestan, the Provinces of Rostov-on-Don, Stalingrad and Voronezh, and in the Crimea. The species found were : *Aphis* (*Doralis*) *laburni*, Kalt., *A.* (*D.*) *frangulae*, Koch, of which three varieties occur, *Myzocallis* (*Therioaphis*) *ononidis*, Kalt., and *Myzus* (*Phorodon*) *persicae*, Sulz., all of which infest the foliage, causing crop losses of 34–68 per cent., and *Trifidaphis phaseoli*, Pass., which attacks the roots [*cf. R.A.E.*, A **22** 56]. Of these, only *A. laburni*, the male, oviparous female and fundatrix of which are described, causes serious losses to cotton, whereas *A. frangulae* is considerably less injurious and the other species are of no economic importance.

The following is based on the author's summary : In the spring, the Aphids appear on the cotton plants immediately after the formation of shoots ; in the northern Caucasus this occurs between 10th May and the beginning of June. The date of sowing has no influence on infestation, and in the 4–6 weeks that follow germination, the Aphids steadily increase in numbers. The population then decreases, and in the second half of July, no Aphids are present on cotton. They reappear in September, though usually in considerably smaller numbers than in the spring. Control measures should, therefore, be carried out chiefly from the end of May up to about mid-July. In some years, however, Aphids, chiefly *A. frangulae*, may be abundant in the autumn, especially in southern districts. The decrease in the second half of the summer is greater when the humidity is low and smaller when humidity is high, and an outbreak may be expected in the first half of the summer if the weather is damp and moderately hot. In the autumn the Aphids are present in numbers if warm and moderately damp weather is extended over a lengthy period. Heavy rains wash the Aphids off the leaves, and occasionally outbreaks are terminated in this way. Considerable control is exercised by natural enemies, including Coccinellids [*cf.* **26** 238, 353], larvae of *Chrysopa* sp. and Syrphids.

A list is given of the food-plants, mostly leguminous, on which *A. laburni* has been recorded in the cotton-growing districts in the south of European Russia ; they include 13 cultivated plants and 20 weeds. In the region of Ordzhonikidze, alate and apterous, viviparous, parthenogenetic females are present during the whole of the vegetation period. Sexuales, comprising alate males and apterous females, appear at the beginning of November, and eggs, which hibernate, are deposited on wild and cultivated lucerne. The sexuales markedly predominated over the other forms until the middle of December, when a general decrease in numbers occurred, but single sexual individuals were observed on lucerne throughout January, indicating that in the south of European Russia they may also overwinter. The eggs hatched at the end of March or beginning of April, and the first apterous fundatrices occurred on lucerne on 12th April. Under laboratory conditions, they lived up to 46 days and produced up to 103 larvae. In the field winged migrants began to appear early in

May and migrated from lucerne to other plants, including *Robinia pseudacacia*. In the northern Caucasus, acacia usually becomes infested in the first ten days of May, and cotton 10–14 days later. Special observations on the infestation of cotton grown close to leguminous plants showed that plots situated close to a strip of white acacia or to infested fields of sainfoin [*Onobrychis sativa*] were invariably more severely infested than those a mile away. In view of the part played by *R. pseudacacia* as a source of infestation, the question of excluding this tree from protective strips planted near cotton fields should be considered.

A. frangulae infested cotton in the first half of the summer and again in September. In the region of Ordzhonikidze in 1936 it appeared on this crop in May, almost simultaneously with *A. laburni*, and it was the predominant species in July, infesting 41·8 per cent. of the plants. The Aphids practically disappeared in August, but again increased in numbers in September, although the infestation of cotton did not exceed 4·5 per cent.

A brief outline of a system of control measures is given [*cf.* **22** 57]. It includes the destruction in autumn and winter of the eggs on lucerne by applying ovicides or by burning the stubble, the use of insecticides in the first half of the season on lucerne, acacia and cotton in that order (spraying with a solution (1 : 1,000) of anabasine sulphate containing 40 per cent. anabasine gave excellent results) ; and the cultivation between the plots of a crop that is not attacked by Aphids.

THIELMANN (K.). **Die Nematiden der Lärche, eine bionomisch, ökologisch forstwirtschaftliche Untersuchung.** [The Nematids of Larch. A bionomic and ecological Forestry Investigation.]— *Z. angew. Ent.* **25** pt. 2 pp. 169–214, 20 figs., 1 col. pl., 2 pp. refs. Berlin, July 1938. [Recd. January 1939.]

A mass increase of sawflies on larch, resulting in considerable injury to the needles, was reported in Bavaria in 1933, and gave rise to investigations the results of which are given in this paper, together with a key to the larvae of the five species observed. These were *Pristiphora* (*Nematus*) *erichsoni*, Htg., *P.* (*Lygaeonematus*) *wesmaeli*, Tischb., *P.* (*L.*) *laricis*, Htg., *Platycampus ovatus*, Zadd., and *P. pectoralis*, Lep. The larvae of these five species are described, and an account is given of their bionomics, so far as they are known, based on the literature and the author's own observations. Of the larval material studied, about nine-tenths belonged to *Pristiphora wesmaeli* and *P. laricis*.

The species studied were monophagous. Maps of Europe and North America are reproduced, showing that *P. erichsoni* occurs only in a small portion of the larch area, being restricted in distribution by temperature and rainfall. In North America, this species causes considerable damage in regions where the temperature averages 12°–20°C. [53·6°–68°F.] and a monthly rainfall of $2\frac{1}{4}$–$4\frac{1}{2}$ inches occurs in the months during which oviposition and larval development take place. A major infestation of this species is considered unlikely owing to adverse climatic conditions in Germany. Only a few larvae of *P. erichsoni* were found in Bavaria. Flight and oviposition appear to occur from May to July. The larvae fed on the needles of the short shoots, but in the absence of these they accepted long ones. The

larval stage lasted 3–4 weeks, the optimum temperature for development being 18–20°C. [64·4–68°F.]. In the laboratory, larvae spun cocoons only at 100 per cent. relative humidity, and the pupal stage lasted 2–4 weeks. Control is difficult. At least two applications of a dust insecticide would be required, and it is considered that this is economically impracticable. The encouragement of birds and mice and the creation in the forests of conditions favouring larch as much as possible are the measures suggested as most suitable to Germany.

P. wesmaeli, the bionomics of which are very similar to those of *P. erichsoni*, has been common in Bavaria in recent years. It occurs in regions with very diverse climates. It is often mistaken for *P. laricis*, and many records of the latter should be referred to it. It is widespread in Europe, and its comparative rarity in Central Europe is ascribed to the fact that larch is grown mostly in mixed stands. The eggs are laid mainly on the upper part of the tree, but seldom on the leading shoot. Females deposited about 70–90 eggs, and parthenogenetic reproduction occurred. The egg stage lasted 6–10 days, and the larval stage 10–14 days up to the last instar, which required 8–10 days. The larvae, unlike those of the other species studied, fed almost exclusively on the long shoots. They hibernated in cocoons in ground litter just above the surface of the soil, and pupated in spring, the adults emerging 3–4 weeks later. No second generation was observed. Considerable injury is caused to young trees 4–25 years old, especially if the infestation occurs jointly with that of species attacking the short shoots. The measures recommended for control of *P. wesmaeli* are similar to those suggested for *P. erichsoni*. The parasites observed comprised two Ichneumonids, *Tryphon utilis*, Tischb., and *Campoplex convexus*, Tischb., and a Tachinid, *Ptychomyia selecta*, Mg.

P. laricis, which is the most widespread larch sawfly in Europe, is very abundant in Bavaria and occurs with *P. wesmaeli*. Males from overwintered cocoons appeared on 30th April and females on 3rd May ; they were active in sunny weather. The females began ovipositing after 2–3 days, almost exclusively on the young needles of the short shoots, since few long shoots were available at this date. In the laboratory at 22°C. [71·6°F.] and 75 per cent. relative humidity, larval development from hatching to cocoon spinning was completed in 20–30 days. The method of feeding is described. Larvae that spun cocoons at the end of June or early in July pupated in a very short time. Adults emerged in 4–5 weeks, and the larvae resulting from them fed up to the second half of September and then spun cocoons in the ground for hibernation. In general, *P. laricis* resembles *P. wesmaeli* in its tolerance of climatic variations. At average temperatures of 14 and 23°C. [57·2 and 73·4°F.] larval development from egg to cocoon lasted 30 and 19 days, respectively. No development occurred at 11°C. [51·6°F.]. Unless the humidity was almost 100 per cent., the cocoons were incompletely spun and the larvae shrivelled up. *P. laricis* injures trees up to 25 years old and is a serious pest, as outbreaks last several years. Repeated defoliation is fatal to the trees, especially to those on poor soil and particularly in a dry year. Parasitism of this species, mainly by Ichneumonids, was observed, but was not sufficient to afford any appreciable control. Parthenogenesis occurred, the resulting progeny being exclusively male. Larvae of *Platycampus pectoralis* and *P. ovatus* were found at the end of June and early in August, this indicating that there are two generations a year. In breeding experiments, 5 of 22 adults of *P. pectoralis* bred from larvae

were males. The adults of both species were similar in their habits to those of *Pristiphora laricis*. The number of eggs deposited per female of *Platycampus pectoralis* varied from 60 to 120 and averaged 85. The larvae hatched in 6–10 days and fed on the short shoots, as also did those of *P. ovatus*.

VON WINNING (E.). **Versuch einer Monographie von *Tortrix pronubana* Hübner mit experimentellen Untersuchungen über das biologische Verhalten des Insektes zur Klärung seiner Bedeutung als Pflanzenschädling.** [An Attempt at a Monograph on *T. pronubana*, with experimental Investigations on the biological Behaviour of this Insect to elucidate its Importance as a Plant Pest.]—*Z. angew. Ent.* **25** pt. 2 pp. 215–276, 20 figs., 3 pp. refs. Berlin, July 1938. [Recd. January 1939.]

Tortrix pronubana, Hb., was first recorded in Germany in 1925, when it was imported into eastern Germany with carnation cuttings from the Italian Riviera.

In this paper are given detailed accounts, based partly on the literature of its taxonomy, morphology, bionomics, world distribution, food-plants, parasites and control, together with the results of extensive laboratory experiments on larval feeding and the effect of temperature on development. The larvae were highly polyphagous, and it is considered that the reason why *T. pronubana* has not yet become established in Germany as a field pest is that the average annual temperature there is below 10°C. [50°F.], which does not permit continued development.

GÄBLER (H.). **Die Bedeutung einiger Wanzenarten als Feinde der Nonne.** [The Importance of some Species of Bugs as Enemies of the Nun Moth.]—*Z. angew. Ent.* **25** pt. 2 pp. 277–290, 3 figs., 10 refs. Berlin, July 1938. [Recd. January 1939.]

In the course of a recent infestation of forests in Saxony by the nun moth [*Lymantria monacha*, L.], considerable numbers of bugs were observed. The commonest species were the Pentatomids, *Picromerus bidens*, L., *Troilus luridus*, F., and *Pentatoma rufipes*, L., of which the nymphs and adults are described.

References in the literature (mainly Schumacher's paper published in 1910) to the predacious activities of these three Pentatomids are discussed, and compared with the author's observations. *Picromerus bidens* was the only species that exercised any control over the nun moth. It is predacious on the larvae and occasionally attacks freshly formed pupae and newly emerged adults still unable to fly.

SCHIMITSCHEK (E.). **Beiträge zur Forstentomologie der Türkei. I.** [Contributions to the Forest Entomology of Turkey. I.].—*Z. angew. Ent.* **25** pt. 2 pp. 291–310, 12 figs. Berlin, July 1938. [Recd. January 1939.]

The larvae of a Buprestid, *Poecilonota festiva*, L., mine the cambium and sapwood of trunks of 35–40 year old cypresses, *Cupressus sempervirens horizontalis*, in European Turkey. The galleries are filled with frass. Pupation takes place in the sapwood. Adult flight occurs in May and probably extends into June, and the life-cycle is

believed to last two years. *P. festiva* is a secondary pest, ovipositing in trees attacked by honey-fungus.

Chrysobothris igniventris, Reitt., is another secondary pest. Near Istanbul it attacked 30–37 year old pines, *Pinus halepensis* and *P. nigra*, injured as a result of unfavourable soil and dry winds. The larvae mined between the bark and the wood, filling the galleries with frass. Pupation usually took place in the wood after hibernation in the mature larval stage, though a few half-grown larvae overwintered and then resumed feeding. Development usually requires a year. Flight occurs in June and July. *C. igniventris* was parasitised by a Braconid, *Doryctes gallicus*, Reinh., the larva of which lives in the host larva and pupates in a cocoon in the mine. In 1937 the adults emerged between 18th and 30th May. The occurrence of *D. gallicus* in Turkey and its parasitism of *C. igniventris* are new records.

A Scolytid, *Phloeosinus armatus*, Reitt., was found in 1937 in *Cupressus sempervirens pyramidalis* and *horizontalis* in the region round Istanbul. Its mines are fully described. The first flight occurred in the first half of April, but the times of the second and third were not observed. *P. armatus* is generally a secondary pest, attacking trees weakened by other causes, but it was also observed boring into some quite healthy trees. It occurred alone or associated with *P. bicolor*, Brullé, and *Poecilonota festiva*. The use of trap logs is suggested.

A Tineid, *Lithocolletis platani*, Stgr., was observed in 1937 near Istanbul and in Anatolia mining the leaves of *Platanus orientalis* and *P. occidentalis*. A severe infestation results in a great reduction of leaf surface and in a loss of growth. About mid-June severely infested trees put forth new shoots. Two parasites were bred from the pupae, *Sympiesis turcicus*, sp. n., and *Entedon auronitens*, Ratz., var. *turcicus*, n., both of which are here described by Fahringer.

A Cercopid, *Aphrophora* (*Philaenus*) *spumaria*, L., occurred in a forest nursery on the Black Sea coast of Anatolia, chiefly pines being infested.

Schedl (K. E.). **Erwiderung zu dem Aufsatz der Herren J. Trägårdh und V. Butovitsch. "Einige Bemerkungen über quantitative Untersuchungsmethoden zur Berechnung des Borkenkäferbefalles."** [A Reply to the Paper by I. Trägårdh and V. Butovitsch "Some Remarks on quantitative Investigation Methods for calculating Bark-beetle Infestation."]—*Z. angew. Ent.* **25** pt. 2 pp. 311–329. Berlin, July 1938. [Recd. January 1939.]

Trägårdh (I.) & Butovitsch (V.). **Schlusswort.** [A final Word.]—*T.c.* pp. 330–336.

In the first paper, Schedl discusses various points in the criticism by Trägårdh and Butovitsch [*R.A.E.*, A **25** 729] of a paper by him [**24** 814], the second comprising a reply to these statements.

Zacher (F.). **Die Vorratsschädlinge Aegyptens.** [Pests of stored Products in Egypt.]—*Mitt. Ges. Vorratsschutz* **9** nos. 4–6 pp. 37–45, 56–59, 61–63; **10** nos. 4–6 pp. 43–45, 51–53, 64–66; **11** nos. 3–6 pp. 42–44, 55–57, 66–68, 78–82; **12** nos. 1, 3, 5, 6 pp. 6–7, 31, 61–62, 72–73; **14** no. 6 pp. 71–73. Berlin, 1933–36, 1938.

This paper contains records of the insects and mites that infest warehouses, storeyards, shops and mills in Egypt. In most cases they

also show the distribution of the species in other countries. The principal pests are also grouped according to the kinds of products in which they occur, with particulars of their parasites and predators. Brief accounts are given of the methods used in Egypt for fumigating grain with hydrocyanic acid gas and for hot-air treatment.

ZACHER (F.). **Die Kornmotte und die Roggenmotte.** [*Tinea granella* and *T. secalella*.]—*Mitt. Ges. Vorratsschutz* **14** no. 6 pp. 65–70, 7 figs. Berlin, November 1938.

From examination of samples of German grain, the author has found that besides *Tinea granella*, L., which infests wheat and rye, a second species occurs which appears to be confined to rye and is here described from the adult male as *T. secalella*, sp. n., and compared with other species of the genus. It was obtained from samples of rye from Prussia and Poland.

The eggs of the two species are described. In the laboratory, females of *T. secalella* oviposited on 16th and 17th September and the larvae hatched in 10 days at 14–22°C. [57·2–71·6°F.]. The author has so far observed only one flight period, from June to September, for *T. secalella*, whereas adults of *T. granella* have appeared in March and again in July–November. In both species, some of the larvae appear to give rise to adults in autumn, while others do not pupate until the following spring.

The grain should be thoroughly turned over with a shovel when the adults are present in the store room, and this treatment should be continued for at least 2–3 weeks after they disappear, so as to ensure the destruction of the larvae. The adults can be trapped in trays of water.

ZACHER (F.). **Bemerkenswerte Fälle des Auftretens von Vorratsschädlingen 1937–1938.** [Noteworthy Cases of Infestation by Pests of Stored Products in 1937–38.]—*Mitt. Ges. Vorratsschutz* **15** no. 1 pp. 1–5. Berlin, January 1939.

This article comprises a large number of records of pests of stored products in Germany from November 1937 to December 1938 that are considered to be of special interest. *Tinea secalella*, Zacher, described in the preceding paper, was found on dried fungi in Berlin.

PHILLIS (E.) & MASON (T. G.). **Observations on the Selenization of Cotton under Field Conditions in Trinidad.**—*Emp. Cott. Gr. Rev.* **15** no. 4 pp. 290–294, 5 refs. London, October 1938.

The results of recent work in Trinidad on the effects on the infestation of cotton plants of solutions containing selenium [*R.A.E.*, A **26** 65] were confirmed by tests under field conditions. Solutions of sodium selenate were applied in small doses to soil planted with cotton in May, over a period of six weeks; the applications, which totalled 4, 12

and 24 lb. selenate per acre, did not seriously affect the growth and setting of bolls.

About a month after the first boll had opened, adults and nymphs of *Dysdercus howardi*, Ballou, were abundant on the controls, and less so, although still numerous, on plots receiving 4 lb. selenate, while no nymphs and only a few adults were present on the other plots. When first-instar nymphs were fed in the laboratory on seed from untreated plots, they all gave rise to eggs that hatched, but when fed on seed from the three series of treated plots, those on seed receiving the first treatment matured in some cases but did not oviposit, while in the other two series all died within 16 and 12 days, respectively. When fed on green bolls about 5–6 weeks old from the various plots, nymphs on the controls and on material receiving the first treatment gave rise to adults that laid viable eggs; on material receiving the second treatment, most of the nymphs died within 16 days, only a few adults, which did not oviposit, being obtained, and on material receiving the third treatment, all the nymphs died within 16 days. When bolls about 2–3 weeks old were used, the nymphs did not develop, even in the controls.

The total number of larvae of *Platyedra gossypiella*, Saund., in 300 bolls from the untreated and treated plots were 239, 301, 126 and 13, and of these, 10·5, 17·7, 37·3 and 5·7 per cent., respectively, were dead. The bad condition of the bolls in the controls seemed to indicate that many of the larvae had left at the time of the count.

Bolls and seed from the second crop, which matured about 4 months after the first, were no longer toxic to stainers and bollworms, since the selenate was rapidly leached from the soil, which was a highly porous loam. There was no quantitative relation between the selenium content of the soil and that of plants growing in it. The advantages and risks of this treatment are briefly discussed, and it is considered that the early planting of a small treated area would help to reduce infestation of the main crop. The toxic seed might be used both as a trap after the main crop is reaped and the plants burnt, and as a source of seed supply for the next year's main crop.

Diseases and Pests of Cotton.—*Rep. 3rd Conf. Cott. Gr. Probl.* pp. 81–129, 12 refs. London, Emp. Cott. Gr. Corp., 1938.

The following are summaries of the papers read and of the discussions on them:

Parnell (F. R.). Plant Breeding and Cotton Insect Pests, pp. 81–85. The author briefly discusses cultural methods for preventing or minimising injury to cotton by insects. A type of plant that thrives and fruits well in the area concerned is more likely to escape injury and, if attacked, to give a good final yield. Where the attack develops regularly at certain seasons, it may be possible to avoid injury by changing the date of planting or by using a strain with a longer or shorter maturation period, but if the attack occurs irregularly, a type should be selected that fruits steadily over a long period. Breeding strains resistant to specific insects is complicated by factors, other than true resistance, that give rise to comparative immunity. The adult of the American bollworm [*Heliothis armigera*, Hb.] is attracted particularly to the better developed plants in a patchy crop and prefers

the more fruitful varieties, so that the best strains are likely to be most damaged. As a result, poorly developed and lightly fruiting types sometimes yield more than good, heavily fruiting types nearby. Where several different varieties are grown near together, and the insect population is not overwhelming, it is to be expected that the most attractive varieties will be most severely infested. The least attractive grown by itself, however, might suffer as much damage as the most attractive in the same circumstances. The heavy damage caused by stainers [*Dysdercus* spp.] in bushy and leafy growth may be wholly or partly due to its greater attractiveness resulting in heavier puncturing of the bolls, increased infectiveness with the fungus involved of the stainers living in the type of microclimate afforded, or differences in the physiological condition of the bolls, and their reaction to infection.

Phillis (E.) & Mason (T. G.). On the Use of selenised Cotton as a Poison Bait, pp. 85–87. The information in this paper has already been noticed [see preceding abstract].

Hartley (B. J.). Damage to Cotton caused by Termites, pp. 87–88. In the Lake Province of Tanganyika, living cotton plants in rotation with sorghum or other cereals are subject to severe attack by termites, particularly when planted on red loam soils poor in humus. It is suggested that the introduction of a grass break into the rotation would enable cotton-growing to be continued in it without excessive injury. In the discussion, pp. 88–100, F. S. Parsons stated that an early loss of fruit, resulting from an attack by larvae of *H. armigera*, appeared to disturb the plant, so that the weight of seed cotton was adversely affected in bolls formed subsequently.

McKinstry (A. H.). Major Pests of Cotton in Southern Rhodesia, pp. 101–103. Prentice (A. N.). Pest Evasion in the Sabi Valley by out-of-season Planting, pp. 103–105. Bebbington (A. G.) & Allan (W.). The Stainer Position in Northern Rhodesia, pp. 106–110. Ducker (H. C.). Diseases and pests of Cotton. A brief Note on the present situation in Nyasaland, pp. 111–114. Most of the information in these papers has already been noticed from the Progress Reports of the Experiment Stations [*R.A.E.*, A **26** 364, etc.]. In Northern Rhodesia, additional observations on stainers were made in two river valleys where the temperatures were higher, the growing season longer, and the growth of the plants more rapid than in the original plateau areas. In both valleys, *Dysdercus fasciatus*, Sign., appeared in large numbers towards the end of the season, and *Adansonia digitata* seemed to be a more common food-plant of this species than *Thespesia rogersi*. *D. superstitiosus*, F., which was also present, was not a serious pest where the annual rainfall was about 40 ins. In the valley, where the annual rainfall was about 18–20 ins., many species of *Hibiscus*, which were more numerous and of denser growth under these conditions, matured and died off early in 1938, so that the stainer migrated to cotton early ; this suggests that an early maturing crop should be grown in this region. At Domira Bay, Nyasaland, a close season of three months in 1937 reduced the numbers of larvae of the red bollworm [*Diparopsis castanea*, Hmps.] on cotton in 1938 by about 70 per cent. as compared with the previous year. It is considered that the close season should not be shorter than this and should preferably extend into the early part of the rains.

Squire (F. A.). Early Larval Mortality of *Platyedra gossypiella* (Saund.), pp. 114–116. Investigations in the West Indies showed

that easy penetration of bolls by newly-hatched larvae of *Platyedra gossypiella*, Saund., depended on the degree of roughness of the boll surface, since they could not obtain a purchase on a smooth surface, and not on the softness of the parietals, since there were no marked differences in the moisture contents of various types of bolls. In the discussion, pp. 116–125, F. S. Parsons stated that at Barberton oviposition by *H. armigera* on a strongly aromatic species of *Dolichos* occurred considerably before flowering [*cf.* **26** 366], whereas on other species nearby it did not occur until they flowered. Preliminary investigations in Swaziland indicated the possibility of bringing the crop into fruit after the season of moth flight (about 30th April) by planting after rain or under irrigation two or three months later than usual.

Squire (F. A.). The Survival of the Pink Bollworm in the Field, pp. 126–129. This is a general account of the factors affecting the survival of *P. gossypiella*, with particular reference to conditions in the West Indies. In these Islands, with the possible exception of Barbados [*cf.* **26** 446], the chances of survival are very slight in cotton fields which have been pulled. During the close season, cotton residues are quickly absorbed, as the rate of decomposition is rapid and high humidity terminates the resting stage of the larvae. However, residues consisting of partially open bolls in which the seeds are protected by lint are very resistant to weathering. It is doubtful whether the local practice of destroying all cotton residues by fire before the beginning of the close season, with the consequent reduction in soil fertility, effectively controls the carry-over, or whether it would be more satisfactory to plough in the cotton stalks and residues.

Papers noticed by Title only.

Hundertmark (A.). **Modellversuche über die Orientierung der Eiraupen der Nonne (*Lymantria monacha* L.) und ihre ökologische Auswertbarkeit.** [Model Experiments on the Orientation of First-instar Larvae of the Nun Moth, *L. monacha*, L., and their Utilisation in Ecology.]—*Z. Forst- u. Jagdwes.* **70** pp. 225-270, 1938. (Abstr. in *Z. PflKrankh.* **48** pt. 12 p. 621. Stuttgart, 1938.) [*Cf. R.A.E.*, A **24** 750; **25** 526.]

Wünn (H.). **Zur Coccidenfauna von Schleswig-Holstein.** [Records of Coccids and one Aleurodid together with food-plants in Schleswig-Holstein.]—*Schr. naturw. Ver. Schl.-Holst.* **22** no. 1 pp. 1–69, 1 pl., 89 refs. Kiel, 1937.

Lindinger (L.). **Verzeichnis der aus Nordwest-Deutschland, insbesondere aus Gross-Hamburg gemeldeten Schildläuse (Homoptera-Coccoidea).** [A list of 74 Coccids with their food-plants from north-West Germany, particularly Hamburg.]—*Verh. Ver. Naturw. Heimatforsch.* **26** pp. 1–15. Hamburg, 1938.

Uyttenboogaart (D. L.). **Die Reismehlkäfer der Gattung *Tribolium*.** [The Rice Flour Beetles of the Genus *Tribolium*.]—*Mitt. Ges. Vorratsschutz* **14** no. 6 pp. 74–76; **15** no. 1 pp. 10–13. Berlin, November 1938–January 1939. [See *R.A.E.*, A **22** 229; **24** 493.]

Schmidt (E.). **Gemeiner Pelzkäfer in einer "Steinmetz"-Kleieprobe.** [*Attagenus pellio* in a Sample of Steinmetz Rye Bran.]—*Mitt. Ges. Vorratsschutz* **15** no. 1 p. 8. Berlin, January 1939.

Subklew (W.). **Zur Morphologie der Larve von** *Melolontha hippocastani* **Fabr.** [The Morphology of the Larva of *M. hippocastani*.]—*Arch. Naturg.* (N.F.) **7** pt. 2 pp. 270–304, 24 figs., 39 refs. Leipzig, 1938.

Hille Ris Lambers (D.). **Notizen über die Aphiden der Venezia Tridentina. III.** [Notes on the Aphididae of Venezia Tridentina. III (descriptions of 1 new genus and 3 new species).]—*Mem. Mus. Stor. nat. Venez. trident.* **3** fasc. 1 pp. 53–57. Trento, 1935. [*Cf. R.A.E.*, A **20** 122.] [Recd. December 1938.]

Hille Ris Lambers (D.). **Katalog der Aphiden der Venezia Tridentina. III.** [A List of the Aphididae of Venezia Tridentina. Part III.]—*Mem. Mus. Stor. nat. Venez. trident.* **3** fasc. 1 pp. 59–64. Trento, 1935. [*Cf. R.A.E.*, A **20** 119.] [Recd. December 1938.]

Masera (E.). **Artropodi dannosi al** *Bombyx mori* **L. ed alla seta** [a review from the literature of Arthropods harmful to *B. mori* or to silk in Europe and Asia].—*Atti Acc. Padova* N.S. **53** (Sci. fis. mat.) pp. 139–157, 8 figs., 38 refs. Padua, 1937.

Roark (R. C.). **Review of United States Patents relating to Pest Control** [July–December 1938] **11** nos. 7–12; 10, 11, 9, 8, 10, 11 pp. multigraph. [Washington, D.C.] U.S. Dep. Agric. Bur. Ent., 1938.

Ewing (H. E.). **A Revision of the Mites of the Subfamily Tarsoneminae of North America, the West Indies, and the Hawaiian Islands.**—*Tech. Bull. U.S. Dep. Agric.* no. 653, 63 pp., 25 figs., 35 refs. Washington, D.C., 1939.

Brittin (G.). **A systematic Classification of** *Pseudococcus* **and some related Genera—Part I.**—*Trans. roy. Soc. N.Z.* **68** pt. 3 pp. 325–348, 1 pl., 7 refs. Wellington, N.Z., December 1938.

Takahashi (R.). **Two Parlatoriini from India (Hemiptera, Coccidae)** [including *Cryptoparlatorea pini*, sp. n., on pine].—*Proc. R. ent. Soc. Lond.* (B) **7** pt. 12 pp. 271–272, 1 fig. London, 15th December 1938.

Shinji (O.). **Two new Species of Japanese Aphididae.**—*Kontyû* **13** no. 1 pp. 39–41, 1 fig. Tokyo, January 1939.

Gunn (D. L.) & Cosway (C. A.). **The Temperature and Humidity Relations of the Cockroach** [*Blatta orientalis*, L.]. **V. Humidity Preferences.**—*J. exp. Biol.* **15** no. 4 pp. 555–563, 18 refs. London, 1938. [*Cf. R.A.E.*, A **24** 195.]

Bertand-Rossi (—). **La roténone. Ses propriétés et ses applications** [a review of the literature].—*Ann. Mus. colon. Marseille* (5) **46** vol. 6 fasc. 2, 59 pp., many refs. Marseilles, 1938.

Bégué (H.). **Le dosage chimique des poudres roténonées** [Methods of analysing Powders containing Rotenone].—*Ann. agron.* (N.S.) **9** no. 1 pp. 121–132, 1 fig., 13 refs. Paris, 1939.

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AGRICULTURAL JOURNAL, DEPARTMENT OF AGRICULTURE, BRITISH COLUMBIA (VICTORIA) : Vol. I (1916), Nos. 1 and 2.

AGRICULTURAL NEWS (BARBADOS) : Nos. 1, 25, 26, 34, 66 (1902–04).

ANNALS OF THE QUEENSLAND MUSEUM (BRISBANE) : Nos. 1, 5 and 6 (1891–).

ANNUAIRE ET MÉMOIRES DU COMITÉ D'ÉTUDES HISTORIQUES ET SCIENTIFIQUES DE L'AFRIQUE OCCIDENTALE FRANÇAISE (GORÉE) : Vols. I–II (1916–17).

ARCHIVES DE L'INSTITUT PASTEUR DE TUNIS :
1906–09 ; 1910, fasc. i–iii ; 1911, fasc. iii–iv.

ARCHIV FÜR SCHIFFS- UND TROPEN-HYGIENE (LEIPZIG) :
Bd. XVII (1913). Heft 9.

ARQUIVOS DO INSTITUTO BACTERIOLOGICO CAMARA PESTANA (LISBON) :
Vols. I–II (1906–10). Vol. III No. 1 (1911).

THE BEE WORLD (BENSON, OXON) : Vols. I–II (1919–21).

BIOLOGICAL BULLETIN OF THE MARINE BIOLOGICAL LABORATORY (WOODS HOLE, Mass.) :
Vols. I–II (1899–1901) ; XXIII (1912) ; XXIV (1912) No. 2 ; XXV (1913) Nos. 5–6 ; XXVI (1914) Nos. 1–2 ; XXVII (1914) No. 4 ; XXVIII (1915) No. 1 ; XXIX (1915) No. 5 ; XXX (1916) Nos. 2–3 ; XXXI (1916) Nos. 4 & 6 ; XXXII–XXXIII (1917) ; XXXIV (1918) Nos. 1–4, & 6 ; XXXV (1918) ; XXXVI (1919) Nos. 2–3 ; XXXVII (1919) Nos. 4 & 6 ; XXXVIII (1920) Nos. 1, 2, 5 & 6 ; XXXIX (1920) Nos. 4–6 ; XL (1921) Nos. 1–4, & 6 ; XLI (1921) Nos. 2 & 3 ; XLII (1922) Nos. 1–3.

BOLETIN DE LA DIRECCION DE ESTUDIOS BIOLOGICAS (MEXICO) :
Tomos I–II (1924–25).

BULLETIN AGRICOLE DE L'ALGÉRIE—TUNISIE—MAROC (ALGIERS) :
Année XX (1914). Nos. 7–9, 12–14 and Title-page.

BULLETIN DU COMITÉ D'ETUDES HISTORIQUES ET SCIENTIFIQUES DE L'AFRIQUE OCCIDENTALE FRANÇAISE (PARIS) : Année 1919, No. 1.

CALIFORNIA AGRICULTURAL EXPERIMENT STATION (BERKELEY, CAL.) :
Circulars 14 and 42 (1905–09)

CHACARAS E QUINTAES (SÃO PAULO) : Indices to Vols. X, XI, XII, XIV and XLII, No. 3.

COMPTES RENDUS DES SÉANCES DE L'ACADÉMIE D'AGRICULTURE DE FRANCE (PARIS) : Tome VIII (1922) No. 5.

EGATEA, REVISTA DA ESCOLA DE ENGENHARIA DE PORTO ALEGRE, BRAZIL :
Vols. I–VI (1916–21) ; VII (1922) Nos. 1–5 ; VIII (1923) Nos. 2–5 ; IX (1924) Nos. 1, 4–6.

ENTOMOLOGICA AMERICANA (BROOKLYN, N.Y.) :
Vol. IV (1888) Title-page. Vol. V (1889), Nos. 6 & 8.

ENTOMOLOGISCHE LITTERATURBLÄTTER (BERLIN) : 6. Jahrg. (1906). Nos. 2 & 10.

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